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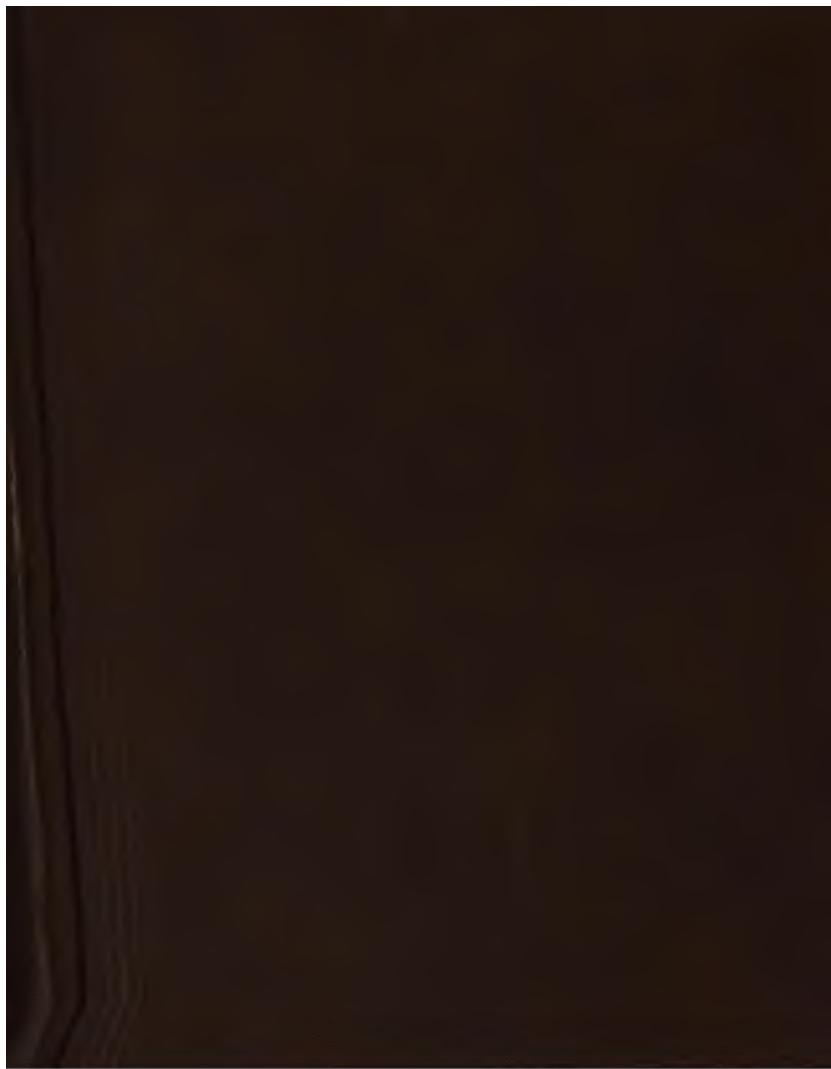
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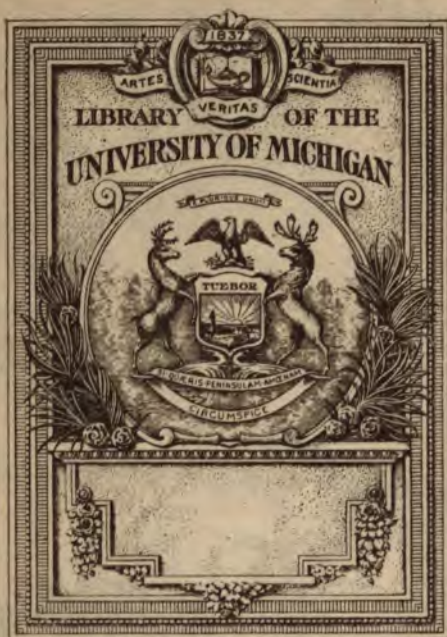
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WORKS BY

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HOW SHALL MY CHILD BE TAUGHT?

PRACTICAL PEDAGOGY

OR



THE SCIENCE OF TEACHING
ILLUSTRATED

BY

LOUISA P. HOPKINS

BOSTON

LEE AND SHEPARD PUBLISHERS

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1887



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HOW SHALL MY CHILD BE TAUGHT?

**ELECTROTYPED BY
C. J. PETERS AND SON, BOSTON.**

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P R E F A C E.

THE following papers were published during eight years in the *Primary Teacher*, edited by W. E. Sheldon. They have the virtue of being immediate reports of actual work with a class of children whose growth from childhood to later youth has justified the methods of that early education.

A protest against the amount of work claimed for one year called out the appreciative explanation of Col. T. Wentworth Higginson, which I append, knowing that my cause is secure in the hands of such a champion of right education.

LOUISA P. HOPKINS.

MRS. HOPKINS' "YEAR'S EXPERIMENT."

BY THOMAS WENTWORTH HIGGINSON.

"THE WRONG HANDLE."

"ALL things," says Epictetus, "have two handles: beware of the wrong one." I have never seen the wrong handle more distinctly used than in the criticisms, public and private, on the essay "A Year's Experiment," by Mrs. Hopkins, published in the November number of the *Primary Teacher*.

The essay gave the extraordinary results of a year's teaching, applied to a class of girls by a teacher of thorough training and much experience, but who had happily escaped what may be called the "ruts" of our public-school system.

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The difference of attitude of the writer and her critics seems at first bewildering; but a little examination will explain it. Perhaps an illustra-

tion will help. I know a scientific man who made a calculation of the amount of space travelled, in a single day, by his boy of four years. I forget the amount, but it was something stupendous. If it had been announced in the public prints that any child of that age had been compelled to walk one-half that distance along a public road, between sunrise and sunset, the Society for the Prevention of Cruelty to Children would have interfered. They would have shown, by irresistible argument, that the task was atrocious; and they would have been quite right, had it been done under compulsion. Yet there is the fact that, when the child is left to itself, it accomplishes twice the amount, and calls it play.

We touch here the precise difference. Looked at from the point of view of the average public school, I should think that Mrs. Hopkins' statement would appear an outrage. For this point of view would be like measuring the miles along the road. Public-school teachers, reading the essay, assume that the author has produced their results, by their methods. Not at all: she has produced her own results, by her own methods. It is evident from her statement that the children enjoyed

themselves as they went along. In my own case there is the additional evidence derived from a personal knowledge of Mrs. Hopkins herself, and from the firm conviction that she would not overwork children, and would not "cram." Of course this is private knowledge, but it seems to me that the article carries its own evidence on that point. I must say, frankly, that I do not think it possible for the best public-school teacher to render justice to what can be done for a picked class of young children whose minds are fresh and unspoiled. Public schools have many strong merits, but their size and their mixed material give very little chance for the kind of talent in teacher or scholar which produces great individual results. Consequently, all steps which look toward fresh and natural methods have to be tried in private schools first. Public schools for drill, no doubt, and for mutual action of mind; but private schools for freshness and originality.

It was the theory of Horace Mann, and nobody has ever got beyond it, that all knowledge is naturally attractive to a child, and that it is our fault if he does not love it all. It is idle to say that there is no royal road to knowledge. Prob-

ably the most extraordinary intellectual feat we perform in all our lives is the learning to spell our own language; and this we do so easily and early that we do not remember anything about it. If we could learn to make other intellectual feats as attractive and natural, they too could be done, in their turn, without tears. Take as illustration the different things taught by Mrs. Hopkins. When her critics hear that her young pupils learned to speak French and German, they are appalled; for they think of long and weary lessons in Ollendorff or Fasquelle. But all experience shows that if you take children early enough, and surround them with people speaking different languages, they will learn two or three of these as easily as one, and with a purity of accent that shames their more learned elders. So in history: when Mrs. Hopkins says of her pupils, "They had quite a clear vision of the course of events in this country for two hundred years," she says what is perfectly practicable; it can be safely claimed that hundreds of children ten years old have learned the same by simply reading and re-reading, to please themselves, the work she names as a text-book.

When one critic says, "No child of ten ought to memorize enough to remember the leading events in our country for the last two hundred years," we see the point of view of the public school. In these schools the "leading events" are often held to include the number of killed and wounded on each side in every battle of the American Revolution. But this is just the method which Mrs. Hopkins sets aside; and experience shows that her success, on her method, is perfectly practicable. So, when we turn to the other studies mentioned, we see the same influence of a wise teacher availing herself of the natural action of the childish mind. Who that has taught natural history to children, in outdoor lessons, in summer, cannot see that this formidable "Zoölogy and Botany" may be so presented as to be a delight? They are such things as children learn in vacation, under right guidance, and call it play. So with even grammar and arithmetic, as here described. The difference between a natural and an arbitrary mode of presenting them is simply the difference between rowing with the current or against it.

Thus the whole paper is to me—interpreting it, no doubt, with personal knowledge of the author—

something very much like the scientific calculation of my friend as to the miles traversed by his little boy. Having carried her pupils easily along, Mrs. Hopkins looks round with amazement to see how far she has brought them. Any teacher who begins by summing up the miles is taking hold of the wrong handle, whether it be done for censure or imitation. But any teacher who will observe and imitate the methods of nature will have reason to be astonished, I am sure, at the distance easily traversed, whether in a day or a year. — *Woman's Journal* of January 19, 1878.

HOW SHALL MY CHILD BE TAUGHT?

CHAPTER I.

THE BABE IN THE MOTHER'S ARMS; OR, PRIMARY TEACHING.

WE are accustomed to apply this expression, Primary Teaching, to a secondary stage of education which begins with the primary school; but there is undoubtedly an earlier teaching, which begins with the opening senses and perceptions of the babe in its mother's arms. The attention of scientists is already turned to this era of education, and Fröbel has formulated its stages to some extent. We might go back of even that for the primary teaching, and suggest instruction for the mother in the very beginnings of her relations with her child, as the former of its being; but for the present we limit ourselves to the consideration of the education which begins with the cradle.

The little unconscious pupil is to be moulded by the most intangible influences. It is impossible to analyze the sympathy and love which emanate from the true mother, and which are the life-elements of the babe's atmosphere. How barren are the regulations of the nurse and physician, compared with the vital force of the mother's absorbed interest! She is content to hold it in her arms day and night, breathing out her love. It may be that a constant magnetic current is still flowing between the child and mother as a channel of growth. Her presence in itself is a gentle stimulus to its development. If we would learn from nature, let us receive this fact as an indication of one important element in the subsequent stages of the child's education. First, an atmosphere must be created in which the formative agencies can work; a magnetic current of sympathy must flow between pupil and teacher, which shall bear freely upon its course all that the teacher has to give and the pupil may receive.

Again, the mother follows her loving instinct in giving to her cradled babe what it shows a desire for, — not forcing a succession of facts upon its

attention ; she gives it time to perceive and receive a distinct image or impression, and then to rest. She neither urges the babe to concentration, nor seeks to divert it when concentrated. She is happy if she be not trying to straiten herself and her child to the rules of society or the maxims of critical aunts and those unnatural dowagers who think the baby should be managed so as to be most easily forgotten and left out of the family calculations. My chief abhorrence is that woman who ridicules a young mother's devotion ; who would have the sensitive babe left to indifferent and ignorant nurses, or to the terrifying phantoms and lonely darkness of its worse than orphaned cradle, while the false or misguided mother entertains her society friends or reads the latest novel. I could summon Ivan Ivanovitch to cleave the head of that cold-hearted woman with his honest axe, as he did that of the Siberian mother who threw her children to the howling wolves. I could stand by at such a drama and say, "Well done, true and honest avenger ; God's man in God's place."

The gospel of the earliest education is the motherly instinct, the highest and oldest revela-

tion of the law and pattern of primary teaching. Fröbel was able to announce its formulæ only by abandoning his mind to the observation of the mother's instinctive methods; that was his domain of discovery. I remember an occasion when two young mothers, thoroughly obedient to that instinct, attended a lecture by an apostle of child-culture. They were amused by the assumption of originality on the part of the lecturer. The maxims laid down were to them axioms, as they have been to every genuine mother since the world began. Fortunately for the race of man, the mothers have been taught by a higher authority than even Fröbel, if they enter upon their vocation obedient to the heavenly vision which is vouchsafed them at the cradle.

Nevertheless, something is gained by a logical statement and analysis of these natural methods of the nursery. The danger is that the statement will become one-sided — that with the inertia and momentum of an enthusiastic idealist, the development of a system of child-culture will be excessive in one direction; the harmony of nature will be destroyed. Let us be careful! how we introduce our hard lines too early into the free

drawing of nature's plan. We should follow, not Fröbel, but the child, and make up our system with a breadth commensurate with the infinite play of its unfolding faculties.

BABY'S OBJECT LESSON.

THE babe in the swinging cradle
Lifts his fair, dimpled hand,
All rosy and soft, and waving
With a gesture of command.

His blue eyes gaze in wonder
At the tapering fingers spread ;
Who knows what dawning fancies
They waken in his head ?

He sees them glow in the sunshine,
He watches their shadows dim,
While he hears the tender music
His mother sings to him.

Fair dream of form and color,
Of motion and beauty bright,
Of light and shadow and music,
Of rhythmic, true delight.

Now the pretty lesson is over,
The dainty hand drops low,
The curtain of sleep is falling
On all that the babe may know.

CHAPTER II.

AFTER THE KINDERGARTEN.

HERE is a class fresh from the awakening love-training of the kindergarten, and ready for the next step in the beautiful unfolding of a true education. Their observing and constructive faculties are all alive and waiting for material to grasp and use. Shall they go on with plays and mere preparation still, or shall we give them more essential work to do, — the discovery of the elements of science, — the ground-work of all the complicated system of human knowledge?

If we observe such a class of children, we shall find their senses on the alert and their memory very impressible and retentive. They see, and love to see, the most minute details, and are susceptible of much training in making special observations; they also learn facts easily, and the memory stores up permanently all in which they have an active interest. Now is the time for their senses to observe, and for the memory to

make a lasting impression of what is observed. The education of the senses should be carried on in the legitimate field of observation, — the material works of Nature. The eye should be trained to discern form, color, size, motion ; the ear to hear and discriminate varieties of sound, and all the senses to occupy themselves in gathering information. What a store of facts may be discovered and laid up in the mind for future arrangement ! Animate and inanimate Nature — an open book, — plants and animals, earths, rocks, clouds, and stars, invite the senses to examine, inspire the child with a thirst for the knowledge that may be gained by his original observation. He wants to learn for himself, to work with his own tools ; nothing escapes his memory which is so graven in by a lively interest. A chance must be given him to see, to hear, or to handle something of the world about him. Select for him specimens, put them before him — the snow, the rain, ice, wind, — lead him to find out what he can of them, without telling him ; spring comes, the trees beckon, the birds call, breezes entice, perfumes allure ; take him into the woods, as Mr. Emerson took his classes, show him the leaves till he learns their

distinctive points, till his eye grows quick to count the pine-needles in their sheaths by twos and threes and fives, till his ear detects the shades of tone which the differing foliage gives to Æolian breezes; or follow Agassiz to the islands and shores, with dredge and microscopes, and let the learner make discoveries there. No living or unliving thing within his grasp, on land or sea, eludes the examination of his senses. What is there in all the books so valuable to him as what he will learn without them? To philosophize and systematize? that he may postpone. Fill his cells with honey first, and the future pupa will thrive in time.

I am more and more convinced that children should be led into these pleasant paths of natural observation very early, while they have a marked love for it, to find that the revelation of knowledge is direct to each one that hungers and thirsts for it, and it is the first business of the teacher to create this hunger by putting appetizing food before the scholar, not cramming it down his throat in doses of books; let him look at the beautiful fruit until his mouth waters for it; let him taste it by so much as he can put into his

own mouth at once, and he will learn to love it, and will not be satisfied but with more and more as he is able to digest it. The teacher is with him, not to examine for him, not to force the result of another's observation upon him, not even to examine him, but to direct his senses, to stimulate his desire, to present the essential points of the object before him, and to preserve an underlying method in his observations of which he is as yet unconscious; so there will be little need of mere recitation. Will the child forget a secret of Nature which she herself has revealed to him? Never; he is more receptive and patiently observant than he will ever be again if this opportunity is neglected.

But when shall the primer and the arithmetic be brought in? shall not the child now learn to read and count? Yes, this is indeed the time, before he is impatient of little things, for him to acquire, by a simple act of his ready and enduring memory, many things which must be gained, and are better gained, at the start. But excite his enjoyment in learning by sympathy and activity, combine concerted and audible repetition with physical exercise, — mind, body, and soul all

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working together as they should ; his constructive-ness helps him to put letters and sounds together, to build up syllables, words, and sentences, to commit to memory changes in the forms of words, as the conjugations and declensions, and to become familiar, after Sauveur's method, with words and phrases in other languages than his own. How much of all this may be made a pastime and be all the more thoroughly acquired for future use, and thus the foundation be laid for a true and generous culture !

There are such great differences in children as to their apprehension of moral truths, still more of spiritual truths, that the work must be quite individual in this development ; but what a healthy inspiration, perhaps creative power, comes from all this study of Nature ! With a reverent guide, they feel the nearness and the goodness of the wise and loving All-Father in all that they search into ; they trace his thought there, and learn to love him ; a perception grows within them of something he is ready to whisper to their secret hearts, until they listen for that conscience-word and let it govern them. Such recognition is the germ of all spiritual life, — I had almost said its

flower, — and is waiting to spring up in the heart of childhood ; it takes root in deep principles of life, and grows into virtue, regulating the instincts more surely than precepts, and developing the highest character much better than arbitrary codes.

To bring my thoughts to a focus on this subject, — what shall be attempted for the child who comes from the kindergarten all ready to learn, but as yet unacquainted with books ? I answer, all, and more than all, that may be found in elementary treatises in every department of natural science may be given him in object-lessons, in a comparatively short time, with what is of vastly more importance — an enthusiastic love for these studies, a habit of careful observation, and a training of the senses which shall be a great addition to his power in science, art, or practical life. He may at the same time lay up in his memory the ground facts of written and spoken language and mathematics. Then, by natural stages, he will turn with avidity to records of the observations of others, until a conception of arrangement, generalization, and inference will grow up within him, the dawn of a higher epoch in the harmonious education of the mind.

CHAPTER III.

A YEAR'S EXPERIMENT IN TEACHING.

I HAD the good-fortune, at the opening of the last school year, to receive a class of little girls, whose only previous school-training had been in a well conducted kindergarten. Of course, they were wide-awake, and fresh for study; they made about half of a class of girls, of from eight to fourteen years of age. We studied United States History, with Higginson's text-book, which we read, reviewed, and discussed, until I think they had quite a clear vision of the course of events in this country for two hundred years; certainly, they were thoroughly interested in the subject, so that they listened eagerly to any additional details or accounts I could give them, reading three or four interesting books on the subject of the earlier history, and examining the pictures in Lossing's Field-books and Catlin's "North American Indians"; they also read, of their own account,

other fragmentary histories or tales in connection. We went through Dickens' "Child's History of England" in the same way, with a great many illustrations from various sources. We had the prominent points of Greek and Roman Mythology in oral lessons, reading aloud most of "The Age of Fable," of which excellent abstracts were written, *con amore*, making an exercise and study which proved most fascinating to them.

We reviewed "Miss Hall's Primary Geography," which had been read to them at the kindergarten, and with globe and photographic views kindled their interest to a flame, and passed on to the higher geography, which we prefaced with oral lessons in astronomy, and made our way nearly through the geography of the United States, committing the text to memory, and drawing maps, but occupying ourselves chiefly with imaginary travels and plays at trade and commerce, until the unity and interchange of different localities and countries were well understood and we found unflinching zeal and vivacity pervading the recitations.

Elementary grammar was evolved from their own unconscious knowledge of the language ;

and when their statements were put in systematic order on the blackboard, I showed them, to their surprise and delight, that they had already known all that was contained in "Greene's Introduction," and could parse any sentence not too complicated for their perfect comprehension. Who that had seen their enthusiastic joy at this discovery could have remanded them back to the old treadmill of grammar lessons? Dictation exercises and composition they became very fond of, under somewhat the same method of instruction.

In reading and spelling we kept up a constant exercise, by every conceivable variation of means, especially dwelling upon exact enunciation and natural expression; and we had weekly recitations in good poetry, which were attended to carefully, with some instruction in elocution.

As to mathematics, we had mental exercises as often as seemed advisable, but it was necessary to restrain their excitement by irregular attention to it, though they became very quick and skilful in rapid calculation. We studied Numeration, including, of course, Decimals, and Addition, Subtraction, Multiplication, and Division, applying these fundamental principles to parts of numbers,

as well as to simple and denominate numbers, thereby covering the subjects of Fractions, Decimals, United States Money, Compound Numbers, Metric System, and simple algebraic quantities. We took up Percentage, and some of its applications, where the close of the year left us, having treated the subject thus far simply as varied applications of the rules of Numeration, Addition, and Subtraction, always deducing the rule from a clear comprehension of the method. I need not say that all thoroughly enjoyed the study, and are anxious to go on.

The spring or summer term we devoted to the study of nature. The children became quite familiar with "How Plants Grow," with which they reviewed Botany, after oral lessons on Miss Youmans' plan, analyzing flowers readily, and enjoying much of the higher and more delightful developments of the study, which they remembered after once learning: *e.g.*, the propagation of the orchid; the properties of tendrils; the multiplication of cells, etc.; for it is the opening of these intricate and beautiful vistas before them which most excites their thirst for investigation.

We studied the forest trees of New England,

through Mr. Emerson's book and by walks into the living woods, and examination of specimens. We absorbed all that "Morse's First Book of Zoölogy" could give us; also Mrs. Agassiz's little book on Seashore Curiosities, besides reading works on Land Snails, Butterflies, and other insects. We had oral lessons, well reviewed by written abstracts, and drawings from "Land and Game Birds of New England," so that summer found us with our arms stretched out, and our eyes and hearts and minds open to embrace her beauties of wood and field and seashore. Physiology was thoroughly studied as far as is usual in our high schools, and proved not at all above their comprehension and lively interest.

Drawing was practised successfully under a special teacher, and some of the class developed a decided love and taste for it, making copies of flowers or animals which were quite worth mounting and using as gifts.

Besides these English branches, they all learned to talk French with a charmingly pure and correct accent under a native teacher, whose manner was most inspiring to the class: they went nearly through Sauveur's "*Causeries avec mes Enfants*,"

and learned a few of Fontaine's fables by heart, conversing about them easily with their teacher. They could play a French game quite prettily and intelligibly, and learned by rote the auxiliary verbs and verbs of the first conjugation. They studied German by much the same method, finally reading, with considerable ease and delight, "Grimm's Tales" in the original.

This is a careful and not overdrawn summary of what was done from September 15 to June 15, inclusive, with a class averaging about ten years of age, with very little out-of-school study, and great enjoyment. Our promise for next year is to continue French, German, and Drawing, commence Latin and General History, take up Astronomy and Uranography in oral lessons, and continue Geography with Miss Hall's work, making it coincident in outline with our study of history, as was, I am told, Miss Hall's original plan for her book. We shall go as far with the details of Grammar and the construction of the language as the interest and intelligence of the class can be led, and introduce them to the study of English Literature. We shall continue Mathematics, including Arithmetic, Algebra, and Geometry, only

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learning to an unusual degree; and I cannot resist the conviction that to inspire the young with an enthusiastic desire to know all that God has offered to their comprehension, to give their powers full play in all these infinitely radiating channels of study, making learning a delight, — in some cases almost an ecstasy, — is the plan of nature in the development of a child's being.

CHAPTER IV.

THE OPENING SCHOOL.

God gives you these, his temples, you believe :
Fresh, healthful forms of beauty, soul-lit eyes,
All avenues of knowledge, — to receive
Hints of himself, to grow pure, good, and wise ;
O, make their lives his home ! keep integral
This rhythmic, triune being, — body, mind, and soul !

It is near nine o'clock : the teacher awaits her class in their sunny rooms, and sits near the organ, with her little two-year-old in her lap looking at pictures. One by one the fresh, pleasant girls come in, greeting little Belle and her mother with kisses and cheery salutations. There is no constraint or reluctance in their glad and affectionate manner.

Soon the hour arrives, and, at the touch of the bell, they take their seats, — not with military precision certainly, nor invariably with immediate silence, but with the spirit of good order ; the hush comes soon of itself, and, while Minnie or Alice plays the accompaniment, all sing a hymn,

usually suggested by the teacher, but often by one or another of the scholars; in most cases it is a prayer, and is evidently understood by all as a direct appeal to the unseen One, whom they love. Young girls are, with rare exceptions, religious in their nature. In them the senses of the soul are as pure and delicate as those of the body; they see divine realities and hear divine voices, — especially the voice of conscience, — if not hindered by those whose “hearts have waxed gross,” and whose “ears are dull of hearing,” and whose eyes have closed. How easy to recognize with them, the presence of God! how lovely the sight of their bright, open faces, hallowed by an unwavering and uncorrupted faith, — like flowers of the morning, upturned to the glowing heavens and waving in the pure air!

Sometimes two or three hymns are sung, and occasionally the children recite together some thanksgiving, or petition, or ascription of praise from the Bible. In connection with the study of the outward works of nature, the Psalm cxlviii. comes like an inspiration from their understanding hearts and eager lips, and sounds, as they repeat it together, like a pæan of consecration.

They have no postures or conventionalities before the Spirit of God, nor does the teacher attempt to conceal the attitude of her own heart, whatever it may be, nor does she refrain from uttering any aspiration, as beyond the sympathies of the children, — but the thought and feeling of the hour flow between her and them unfettered.

Now little Belle has to go, since she tunes her baby voice too long; so she says her "Good-bye," to which there is quick response as she throws her kisses back in departing, and the quiet group turn to the Gospel-reading with unfeigned interest. There is more or less comment as they read, singly or in concert, and geographical or historical associations are recalled, or a deeper tone is taken in drawing their thoughts to the spiritual lesson. But the Bible-reading is carried on with frequent variation of method: in connection with the study of Ancient History it was made a panorama of Hebrew history and its correlations with other nations, and the strong pictures that mark different epochs were thrown out before them with great freedom of selection. Sometimes the teacher reads from the French or German Testament, while the children follow each verse with

concert-reading of the English ; for quite a long time each pupil had in turn the charge of selecting and reading the lesson and the hymn.

Now, if there is any special message to these loving young souls from the mother's heart that tries to guide them, it is given, with brevity and tender directness, out of her faith or out of her experience of life, or from her standard of good manners and refined feeling, — any yearning toward the beautiful possibilities of their nature, — she expresses it with at least an earnest sympathy and a magnetic impulse of desire which is never wholly disappointed in their responsive consideration and reception.

"Truth" is the motto of the school, — truth in essence and in manner. Last year they had their badges embroidered in gold, "Die Wahrheit" ; this year the word "Truth" is printed there instead, and is understood to be the talisman of their endeavor. They are taught to avoid disguise and insincerity, and to regulate the sources of emotion, that its involuntary expression may be right. If there is an amusing suggestion or force in the accidents of any exercise, they are allowed to laugh without restraint, and it never really dis-

turbs the mood or seriously interrupts the attention ; for a spontaneous smile or hearty laugh, which is not pent in, passes with the instant, and healthfully relieves the feelings.

No time is needed for the calling of the roll or the hearing of excuses, as no occasion has yet arisen for any exactions in regard to attendance, and a vacancy among the beaming faces is discovered and explained at once ; so at the touch of the bell, the class separates into its distinctive rooms for the more specific training of the mind.

It is needless to say to other teachers that the high ideal of the controlling mind is never reached ; but it is confidently believed that the *teacher* must be superior to the *arts* of discipline and *rules* of method, and must mould the fine material before her chiefly by native force of soul.

It has been a difficult task to portray the intangible influences that enter into the fifteen, twenty, or thirty minutes of the opening of the school ; but if the home-element shall seem predominant, the attempt will not have proved altogether a failure.

CHAPTER V.

THE KEY-NOTE.


As I carried in my mind the theme of this paper, my eye met a paragraph in the September *Teacher*, which is so forcible and concise an expression of what I feel to be the *motif* of my "experiment in teaching," that I might use it as a text: "The object of education ought to be to develop in the individual all the perfection of which he is capable." — *Kant*. As the Delphic oracle instructed Cicero to "follow Nature, and not take the opinion of the multitude for his guide," so, more and more, do intuition and experience say to the teacher of children, "Attune your ear to the whispers of Nature that you may discern the secret of education."

As a mother, I am most concerned that each child in the embrace of home shall receive from me what it needs for its physical, mental, and

moral development. There is great diversity in this small circle ; a difference of temperament, of tendencies, of tastes, of natural powers, and natural wants. I must administer to each, adapt myself to each, meet each on its own track. So, in a school, the teacher must be as the mother, to devise and provide for each one ; she must discern the native stamp of the individual pupil, the character of its organization. When she is thoroughly acquainted with the child, has drawn near to it in an atmosphere of loving appreciation, and placed herself *en rapport* with its intrinsic being, then she is prepared to teach it ; and her teaching on that footing will be not merely the work of the recitation-hour, nor of some departments of instruction, but a deep influence acting everywhere ; whether in school or out of school, — acting, as I can bear witness, through the whole lifetime of that child, and the subject of a life-long gratitude.

Nature emphatically forbids me to try the mechanical process, which treats children in the aggregate, and seeks to produce a dead-level of uniformity in the school ; Nature warns me from merely conventional ruts and unthinking mannerisms. My mother-heart knows better than this.

Do I want my child made like every other child? No, a thousand times! Let her be herself,—trained, developed, ennobled, but always *herself*; her individuality perfect, her identity complete; for, though millions of children arise in the land, there will never be another like this one. I want to see her face glow with the radiance which can be lit on no other brow, and her soul dressed in the beautiful garments which were prepared for her from the foundation of the world. Let those who teach her consult the oracle of her nature, discover the hints within her as to what sort of woman she should become, never lose sight of her in the crowd, nor confound her with her neighbor; but keep her undistorted, uncramped, *ungraded*,—her being wrought upon according to God's pattern for her alone. This is what I ask for my child, and therefore what I demand of myself as the teacher of some other mother's child. Her child is as unique as mine; I must make no encroachment on its ideal individuality, nor attempt to trim and fit its original powers to an unyielding standard. The school of the rule and plumb is a machine-shop; with its constant measurements and tests, its ranks and examinations, it



grinds down these clear-cut crystals of mind into a dead mass ; it stops to pour all the brains within its reach through a weekly sieve, till all distinctive qualities are lost, and not one of the fine units can be distinguished from the still disintegrated whole.

Why is it thought necessary to know and exhibit the comparative progress and attainment constantly ? Is it possible for us to put one mind so by another as to decide " this is higher," " that is lower " ? Brain-power has too many outlets and modes of growth to be subjected to such crude valuations. I will have no comparisons made among my children. I will allow none in my school ; the only relative test I will put is the test of conscience, — Do you rank well in the scale of your possibilities ?

In a small private school, such as has been discussed in these papers, there is, perhaps, an unusual inequality in powers and attainments. It often happens that a child who is peculiar, or who has had an exceptional course of training or want of training, one whose health requires singular care, or whose education has been from some cause irregularly carried on, is placed in

such a "select" school. The class, thus made up of difficult and heterogeneous elements, can hardly be treated as a whole, and yet, in externals, it must be to some extent a unit; but with the subtle insight and magnetic forces which the teacher, as well as the physician, requires and must be able to command, we must treat each mind as distinctly as a skilful physician would treat each separate patient. We must perceive and appreciate the instant want and difficulty in each case, and with imperceptible and sometimes unconscious skill keep each mind supplied and alive. Yes, let us keep each mind *alive* before us, — breathing vitalizing air from the realm in which we are acting as guide or priestess, and then, indeed, we are doing our whole work as teachers. If I try to awaken in each child within my keeping the activities of which it is capable, develop the gifts with which nature has endowed it, round out and perfect the being in its individual beauty, finish the typical design, and assist the creative purpose in the formation of that soul, what more absorbing interest or responsibility can I assume? If I appreciate it, I shall bring all the enthusiasm and sympathy of my

nature, as well as all the attainments of my life, to bear upon it.

And as in the educational economy of Christianity we find a most exact model for such a method, — the teacher having secret sympathy and power with each disciple, — so is it not possible that the parallel may be extended ; and, even in our far-distant following of His ways of working, the phenomenon of seeming miracle may still present itself, — miracle which is only the normal result of a deeper understanding with nature ; a result which, for merely mechanical and superficial methods, is simply impossible.

CHAPTER VI.

ARITHMETIC.

WE believe in the importance of accuracy and rapidity in all simple mental operations, and the arithmetic classes are, therefore, exercised, sometimes individually, oftener in concert, in this work, until they can sustain quite a protracted succession of mathematical operations, including many which, being performed by contraction, sound much more difficult than they are,—so that an examination of the class in presence of visitors will cause quite a sensation, and a feeling that some wonderful feat has been accomplished; but the facility is very easily acquired.

In beginning the study of written arithmetic, the writing and reading of numbers is taught so that the *system* of a uniform ratio of ten is clear, and appeals to their logical sense. This includes decimal fractions, which are nothing else but a legitimate and integral part of the system. It is

just as simple a matter to carry on the decrease by tens to the right of the decimal point as at the left; let us not interrupt the unity of the standard of numeration. The use of the cipher should be made very plain, for it gives a key to the position of the numerical classes. Who that was in the class of arithmetic under the instruction of Mr. Stearns, in the West Newton Normal School, has forgotten the emphasis of that oft-repeated statement, "The cipher means simply that there is nothing here"? The idea and manner of changing figures of one kind to those of another, either by this system of tens or by one of twelves, or by others of varied ratios, can be made plain and fixed clearly in the mind,—and much of the succeeding work is simplified when this is done. It becomes an easy matter to teach addition and subtraction of any figures or quantities after the axiom is thoroughly established, that only things of the same kind can be added or subtracted.

After plenty of drill in these operations the class is led to discover, by repeated and regular additions and subtractions, the multiplication and division tables, which should never be given as an arbitrary standard or invention of man, but only as

a statement of inherent properties which are just as much within their original observations as any other facts of nature. It is astonishing how much of arithmetic a child can discover if placed at the right outlook.

Of course, although the instruction can be carried thus far in a short time, so that the pupils may be said to know and understand the principles, yet a long time is requisite for skill and ease in practice. Simple numbers, compound numbers, decimals, United States money, metric system, duodecimals, proportions, and fractions, put down as so many distinct arithmetical subjects in most text-books, and alarming on that account, are but the variety of material on which to expend all this practice in reduction, addition, and subtraction; and this practice should be vitalized by the interest of personality. Trade is very attractive to children. "Oh I admire bills," says Mabel; and Bertha remarks, "Mamma always takes us shopping with her now, to see that she gets the right change." They go shopping with money in their pockets, — our easy currency; they cross the water and flock into a London shop, with pounds, shillings, and pence,

and Maggie very pertinently inquires why the German and the French money are left out of the arithmetic. They learn to manage the grocer's, the apothecary's, and the dry-goods standards of measure, and hope that the day will soon arrive when the gram, the metre, and the litre will take their place.

The properties of numbers, — factors, — the greatest common divisor, the least common multiple, can be presented and understood as something quite interesting, — and fractions can be dealt with in the light of that essential principle, that quantities must be made of a like kind in order to be added or subtracted, so that all their difficulties vanish, and the method can be easily discovered by the children. All these can be introduced incidentally, and conquered naturally and unconsciously, until the mind of the pupil becomes familiar with them. Why need they be announced with the clamoring bugbear of a new title? Experiment and induction will lead the pupil into all these processes, under a little tact and skill on the part of the teacher.

It is best to avoid the rules and remarks in the books; the books are of no use to the teacher

except for the examples, and even there it adds much interest for the pupils to invent examples to some extent. The *rule* in the formidable terminology of the books is a snag that will founder any little bark, however fairly launched; as a summary, when the child is quite familiar with the operation, it may serve a fair purpose, and is easily explained, but beware of it any further in the child's mathematical career!

Proportion should be made a form of writing fractions, and both presented as an expression of division. Interest, in all its branches, is no more a part of arithmetic than renting a house or any other transaction involving money, and based on the arbitrary determinations of the exchange or the statutes; but, being subject to the application of arithmetical processes, stands connected with the science as astronomy and mechanics do with the higher mathematics.

The pupils must understand this very clearly; *viz.*, that arithmetic is learned when the properties of numbers and the methods of addition and subtraction are mastered; that all the rest is but its application to trade and business and science, — for the square and cube root, involution and

evolution, should be relegated to algebra and geometry, where they belong.

How simple and attractive is the study of numbers inductively considered and stripped of all its excrescences! all the various and sounding lists of the index resolve themselves into a few simple outlines, of which the various sub-divisions only furnish material for the pupil to work upon with the tools which the unencumbered science of arithmetic puts into his hands.

THE CLASS IN ARITHMETIC. — ITS FIRST INTRODUCTION TO COMPOUND NUMBERS.

Maggie, Bertha, Mabel, Louie, Carrie, Anna, Alice, Gertrude, Lillie; all from eight to ten years old.

Teacher. — There sits Emmie, looking at her ivy. Beg pardon, Emmie; but where did you get that dress?

Emmie. — My auntie bought it when we were in London; it is a Scotch dress.

Teacher. — So I thought. It is very pretty. Did she pay for it in dollars and cents?

Emmie. — No 'm; it cost eighteen shillings in English money.

Bertha. — Oh, I know about English money! Clara bought us a great many things in London, and she told me all about it.

Maggie. — I should like to go shopping there; how funny!

Teacher. — Well, let's go this morning. Play we are in London. Have you any money in your pockets? I will say your fathers have given you each £3 to spend; but I am glad, for your convenience, it isn't all in pound-notes, but a two-pound-note, eighteen shilling-pieces, and twenty-four pence, one of which is worth nearly two cents.

Mabel. — Why, is that the same as three pounds?

Teacher. — Yes, if I reckoned rightly. It takes twelve pence to make a shilling, and twenty shillings to make a pound. Let us write it down. Twenty-four pence would then be two shillings, and those, added to eighteen shillings, make twenty shillings, — just the one pound we need to make, with the two-pound note, three pounds. Now, we will buy some pretty things for our friends, this morning. Nella, do you remember the exhibit of English pottery at the Centennial? "Yes"; well,

as it is the fashion to buy such things, let us go into this large warehouse of "James Stiff & Sons," and choose our purchases. You may say, in turn, what you will buy.

Mabel. — I want a majolica *tête-à-tête* set for my mother, on which I can take up her supper when she is sick.

Teacher. — Very well ; I write that down here, while those who know may describe the majolica ware. [The description is quite full and plain from two or three.] I will say that the price of it is £1 12s.

Bertha. — I will take two terra-cotta vases.

Teacher. — Describe them, Bertha ; you say you have two or three terra-cotta ornaments at home. I will put your purchase down under Mabel's ; it comes to 12s.

Louie. — I would like a few handsome tiles for Auntie May.

Teacher. — Yes, four Staffordshire tiles come to 8s. [Alice, Gertrude, and Lillie don't know what they want, and, as they are younger, the teacher chooses for them : A pretty tea-pot for Alice's mother, called a Rockingham tea-pot, for which she must pay 10s. ; a Parian statuette of Cupid

for Gertrude's purchase, worth £1 6s.; and a beautiful platter, of Lambeth pottery, worth. £1 18s., for Lillie to give her papa.]

Anna. — Oh! can I buy some of those lovely little majolica butter-dishes? I know they cost \$4 a dozen here.

Teacher. — Yes, indeed; here are some like fern-leaves, and some like shells, — they are only 10s. a dozen.

Anna. — Then I want a table ornament, too, in that flowered china, or that with birds on it.

Teacher. — We will put it down: Butter-dishes, 10s.; table ornament, in Faience ware, £1 12s.

Maggie. — What shall I have? I can't think.

Bertha. — Oh, Maggie! you and Carrie get some fruit medallions for your mother to hang in the dining-room. I have seen them; they are as nice as pictures.

Teacher. — Very well; Carrie and Maggie get three medallions each for £2 a half-dozen, — you will have to divide the expense afterward. Maggie may pay it now. I will buy two dozen pretty cups for the scholars to keep on their tables. The price is £1 per dozen; how much is that apiece?

Anna. — Well, I know what they would cost apiece if they were a dollar a dozen ; but —

Maggie. — Well, can't we divide a pound by twelve ?

Teacher. — Of course ; what does the pound make twenty of ?

Several. — Oh ! shillings ! change it to shillings.

Bertha. — Twenty shillings divided by twelve is one shilling and eight over.

Teacher. — Now, change the eight shillings left into pence, and divide that by twelve. In one shilling there are twelve pence, so in eight shillings there will be —

All. — Ninety-six pence.

Maggie. — And twelve will go in ninety-six eight times.

Bertha. — It will be one shilling and eight pence.

Teacher. — What will ?

All. — One of the cups.

Teacher. — Do you understand, Carrie ?

Carrie. — I sort of half do and half don't.

Teacher. — Pretty soon you shall all be sure ; but attend now to this. We will find out how large our bill is at Messrs. Stiff's store : —

	£	s.
Majolica <i>tête-à-tête</i> set for Mabel	1	12
2 Terra-cotta vases for Bertha		12
4 Staffordshire tiles for Louie		8
1 Rockingham tea-pot for Alice		10
1 Parian statuette for Gertrude	1	6
1 Lambeth Platter for Lillie	1	18
1 Dozen Majolica butters for Anna		10
1 Table ornament, Faience, for Anna . .	1	12
6 Medallions, Lambeth pottery, for Mag-		
gie and Carrie	2	0
2 Dozen cups for the teacher	2	0

Bertha. — I admire bills. My mamma always takes me shopping with her now, to reckon quickly and find what change she ought to get.

Teacher. — Bertha and Maggie may add these pounds and shillings on the board, the rest on their slates. Alice, Gertrude, and Carrie, come close around me, and let me help you. Come, too, if you want to, Lillie. [After five minutes' work, all attend to the board.]

Carrie. — Maggie's is added one way, and Bertha's the other. Bertha's is like ours, so Maggie's is wrong.

Maggie. — No ; my answer is just the same, only I added the pounds first, and Bertha the shillings. Is mine wrong, Mrs. — ?

Teacher. — No, Maggie ; but it is usual and easier to add the smaller kinds first — just as you add the units before you do the tens. Well, you add the shillings ; it makes —

All. — Eighty-eight shillings.

Teacher. — And if every twenty shillings is a pound, how many pounds are here ?

All. — Four pounds and eight shillings.

Teacher. — And what shall we do with the pounds, Mabel ?

Mabel. — Add them to the pounds, I should think.

Bertha. — Why, of course you do, and it makes twelve pounds.

Teacher. — Yes ; we have spent altogether £12 8s. Now, we will find out how much change we should each have. Mabel had £3, and spent £1 12s. ; she may find out, at the board, what she has left. Bertha spent but 12s. of hers, Louie only 8s. ; they may work theirs out, too.

Mabel. — Why, I don't know how to begin.

Teacher. — See how I write it down : —

	£ s.
	2 20
(Isn't £2 20s. the same as £3?)	1 12
	<hr style="width: 100px; margin: 0;"/>
	£1 8s.

Mabel. — Yes, now I see. I shall have £1 8s. left. Oh, goody! I can buy some more things.

Teacher. — We will go into a lace and dry-goods store another day; so you must be prepared at the next lesson to show what you wish to buy there.

Bertha. — I have £2 8s. left. I changed one of my £3 to shillings, and took my 12s. from it; so, of course, I had £2 8s. left.

Teacher. — Mabel, you may go show Carrie how to find what she will have left; Bertha may show Alice, and Maggie may show any one else — Gertrude, if she will. [After all is clear in adding and subtracting, the teacher gives them the table of English money, which she has written in full on the blackboard; takes them through the process of reduction and multiplication, which she finds them quite ready to suggest for themselves, step by step, and finally points out the dozen or half-

dozen examples in English money — scattered through many pages of the arithmetic — for them to work out before the next lesson, telling them, however, to be sure not to read over anything in the book about it, and particularly no rules.]

Bertha. — Are French money, and German money, and all those, in the arithmetic?

Teacher. — No; only English money. It is not a part of arithmetic; only one of the ways of using arithmetic in trade. I don't know why they put no other kind of money in the book for you to work upon.

Louie. — Well, I didn't care about knowing it; for I never shall buy anything in England — they were so horrid in the Revolutionary War.

Teacher. — The half-hour is over. You have learned quite a good deal. They have some funny names for it in the book.

Carrie. — Please tell us what they are.

Teacher. — Table of English Money, Reduction Ascending, Reduction Descending, Addition of Denominate Numbers; also, Subtraction, Multiplication, and Division of Denominate Numbers. [A shout of laughter.]

After this lesson, which was full of interest and

conversation, of which only the outline is reported, the class were exercised during subsequent lessons in making purchases, in inventing and working out examples, until every member of the class was quite at home in the different processes with English money, since which they find no difficulty in applying the principles to any of the tables of weights and measures ; although it is not the intention of the teacher to keep them long upon those standards, which, it is hoped, will soon become obsolete, but to proceed at once to the Metric System, which requires but a lesson or two, as it is a decimal system, and its terminology is so interesting. The class is warned off from the rules, and anything in the book except the examples, until the time comes for using the rules as a summary of our discoveries.

CLASS IN ARITHMETIC. — INTRODUCTION TO
FINANCE.

Alice, Minnie, Leila, Hattie, Helen, Ethel, Sarah, Alice ; from 11 to 14 years old.

Teacher. — You have studied Arithmetic and its application to trade ; let us now attend to its practical application to the most exciting business

of city life. You know what gold and silver coin is, and how it is used in exchange for all our wants: what else do we have in our purses, Hattie, that will purchase things?

Hattie. — Why, we have bank-bills.

Teacher. — What makes these of any value, more than any other paper? (*Showing a bank-note.*) Read it; it is an agreement to pay five dollars on demand. (*The bill is examined by all.*)

Minnie. — Are all bank-bills like this?

Teacher. — They are substantially the same, — notes, with a promise to pay engraved on the face, “promissory notes,” or “notes of hand”; though these names are given to similar promises which are not current as money. You can get gold or silver at a bank for these. What is a bank, Alice?

Alice. — I think it is a sort of office.

Leila. — It's a place to keep money in.

Hattie. — Yes, I've seen the safe and the clock-key, and they have piles and piles of money! Where do they get it?

Teacher. — A bank is a company of men called stock-holders, who have put a good deal of their money together to make the “capital” of the

bank; they lend and borrow money. They choose officers to do the work, and the two principal officers (the President and Cashier) sign their names to all these promises or bank-notes, for a promise is good for nothing without a signature. The bank will keep your money safe for you, or will lend you money if you pay for the use of it; some banks not only keep your money safe for you, but pay you for the use of it while they hold it, returning it to you with that profit or interest.

Helen. — I know, that is the Savings Bank. I have \$25 in it, and more is added to it every year.

Minnie. — My uncle put \$100 in the bank for me last New Year's Day, and he means to put more in every year, so that when I am grown up I shall have a good deal.

Teacher. — Let me show you how much interest Helen's money gains every year. The bank pays her six cents a year for every dollar she has there, or six cents per hundred, — six per cent. She has \$25.00: how much will they pay her the first year.

Alice. — \$1.50.

Teacher. — Add it to the principal, \$25.00; you

have \$26.50, the amount at the end of the first year. Now this is the principal of the second year, and what will be the interest the second year?

Helen. — \$1.59; and the amount will be \$28.09.

Teacher. — Right: get the amount for the third year, — all.

Ethel. — \$29.7754.

Teacher. — So you see that in three years Helen's money has gained nearly \$5.00. It is better to keep your spare money in the savings bank than in your house, for you get "compound interest" on it; but if you lend your money to a private person, he will pay you six per cent on the original principal only, as long as he holds it, or simple interest. The principal does not roll up.

Sarah. — Why will he pay six per cent?

Teacher. — Because the use of money is a great convenience, and worth paying for. However, men do not invariably pay six per cent for it, — sometimes five or seven, etc. Suppose I borrow \$200 of Alice, how much shall I pay her for the interest for one year at six per cent?

Hattie. — \$12.00.

Teacher. — And if I keep it two years I pay her

\$24.00 of interest. If I keep it six months longer, how much shall I pay?

Leila. — Six months is half a year; and if you pay her \$12.00 for a year, you pay \$6.00 for half a year.

Teacher. — And if I pay six cents on a dollar per year, what must I pay per month, Helen?

Helen. — A month is a twelfth of a year; so you will pay a twelfth of six cents, or half a cent per month.

Teacher. — And if I pay half a cent a month, what for one day?

Alice. — One-thirtieth of half a cent, or one-sixtieth of a cent.

Teacher. — What part of a mill?

Ethel. — One-sixth of a mill.

Teacher. — Now, do you see that if you multiply the number of years by six cents, of months by half a cent, and of days by one-sixth of a mill you will get the interest of one dollar for the given time. How, then, shall you get the interest of the principal for the given time at six per cent?

Leila. — Multiply the interest of one year by the principal.

Teacher. — You may work out the problems in simple and compound interest in the book, before your next lesson. Sarah, did you ever go down town, on Water Street, at 11 or 12 o'clock in the forenoon? If you have, you may have seen almost all the rich men there, meeting one another on the street, or in Mr. Burt's banking-house, or elsewhere. They are the capitalists, whose business is perhaps wholly with this exchange called money.

Ethel. — You could see them in New York, on Wall Street.

Teacher. — Perhaps they meet in a building called The Exchange, or on a street where most of the offices for money are located, where merchants and financiers meet, — “on 'change.” Where did the old Romans meet?

Minnie. — In the Forum.

Helen. — And in Venice they met on the Rialto.

Ethel. — And in New York they go to Wall Street.

Teacher. — At any of these places: what excitement and hubbub! At the Broker's Board in New York it is almost like Bedlam; it is the great

absorbing interest about gold, or the changes in the value of paper money, or of stocks, and you would be hardly able to understand it all. But you could see the feverish worry and contention, — they quarrel and shout. The “bulls” and the “bears” (so called) try to raise the price of gold or to lower it; and all are intensely concerned in the rise and fall. Money is bought and sold, and through all the varieties of business runs the fashion of paying a percentage of the money-basis of any operation to the one through whose hands it passes. The commission merchants, the brokers, the bankers, the tax-assessors, the insurance agents, the custom-house officers, all apply this principle of percentage in reckoning their gains or losses, and working out their business. Ethel, you know that Mr. Allen, collector of this port, sends out the custom-house boat to every in-coming ship: what for?

Ethel. — Because he has to get the tax on all the foreign goods that come here.

Teacher. — Yes; that tax is a fine imposed by the government, — poured into the public revenue. Finance used to mean that, but now it means all departments of business with money

to sell his ship; but here perhaps one man does any one of all of these things. You see the broker sells goods that do not come into his hands, that are untransferable; the commission merchant sells transportable goods from his warehouse. Both are paid a certain percentage, usually quite a small percentage, of the value of their goods.

Minnie. — I wish we could do that kind of business.

Teacher. — Minnie may be a commission merchant at the next lesson; Alice, a broker and banker; Helen, a custom-house collector; Hattie, cashier of a bank; Sarah, an insurance agent, to pay us for our houses when they are accidentally destroyed, provided we pay her a percentage of their value every year till then; Alice may collect the taxes on our property. Talk with any one you know about these various kinds of business, and we will see what forms and methods are used in transacting them. We will find out by degrees the secret of Finance. It's just like some absorbing game in real life. It makes men grow gray, and knit their brows; but it won't do for us to know nothing about it, though the fathers

and husbands and brothers generally do it all for us.

Helen. — Isn't it queer to make such a fuss about money? it isn't really good for anything, is it?

Teacher. — No, its value is all made up or fictitious; it will not in itself do us any good, and when we die it is all thrown away. The miser forgets that, and I think the financiers forget it too, sometimes. It is only the tool of trade. Agriculture, manufacture, and trade feed and clothe us, and develop the resources of the world. What has Finance to do with Arithmetic?

Leila. — I don't see exactly; but yet you can't do business without using Arithmetic.

Teacher. — That's it, exactly; it is carried on by the practical application of the methods of Arithmetic, just as trade is.

CHAPTER VII.

NATURE LESSONS.

A HINT of spring appears, and as we have been waiting for it to study something of outdoor natural science by practical observation, we hail it gladly. Boys and girls, start with your eyes open. Look for the signs of spring as we walk. Tell us what birds you see or hear, what they are doing, how they look, how they fly ; and if you know something of their habits, their haunts, their food, their nests, and their eggs, let us talk about it, that all may be ready to write about it in school to-morrow. Examine the pines to-day especially. I shall ask you many questions about them. Get some of the wood and bark to take home, and pick up some specimens of rock, for we are to learn all we can of trees, rocks, birds, insects, and plants, between now and the long summer vacation, so that you will know where you are, and be well acquainted with your company all through Nature's holiday.

Here is a little bank of snow under the stone wall. We must give it a greeting and farewell, for it will soon go. It glistens on its crusty surface. You have observed the snow as it falls. What do you know of the shape of the flakes?

Helen. — The flakes are one or more little stars of different patterns. I saw a good many copies of snow-flakes in the magazines. They were very pretty.

Madge. — I saw them one day through a microscope. They had each six rays, and some had rays like fern-leaves. Oh, there were so many kinds! but they were all lovely.

Teacher. — Yes, every star, or crystal, has six rays, — sometimes twelve; all the centres have six sides; all are perfectly symmetrical; all its parts are put together at an angle of 60° , — just as if a mathematical law had ruled the formation of all. The earth all winter has been wrapped in this warm, soft blanket of the snow. It has kept the roots safe. How softly and quietly the moisture which formed them arose from the sea; how far the great cloud travelled; how wide it spread, to fall so gently at last just where it was needed!

Mother Nature is a "dear old nurse," to be sure.

Daisy. — You wanted us to look for rocks. Here is a pretty white one ; it looks almost like the snow.

Teacher. — All come near to see it ; find more pieces like it, or mixed with some other kind of rock. It is called quartz. Teddy has a piece, a little different in hue. What is yours the color of, Daisy ?

Daisy. — It is milk-white.

Teddy. — Mine is something like glass.

Teacher. — Daisy's is milk quartz, and Teddy's vitreous, or glassy, quartz. This is very interesting, because when all the outside of the earth was water, this soft, fine sediment was deposited at the bottom of the unbroken ocean, and by heat was made into this rock. It was the bottom of the old oceans that boiled all around the hot globe before any plant or animal was made. It is the oldest rock and the most common. Is it hard ? Try your knife upon it.

Courtenaye. — It is very hard. I cannot make a mark on it.

Teacher. — Take a piece home. It will write

your name on glass. Glass is quartz-sand melted and mixed with soda. It takes a very hot fire to melt it. Crack up a piece. Does it break in even lines?

Prescott. — No, it breaks any way.

Teacher. — *Flint*, you know ; you have a piece at school. This is a kind of quartz. Sometimes quartz is in crystals, and as transparent as glass.

Helen. — Oh, we have a rock at home all covered thickly with crystals, — it is crowded with them.

Teacher. — Amethyst is a purple quartz-crystal. Agates are layers of different colored quartz. The sand of the sea-shore is quartz broken up by the waves. It is found mixed with other minerals, and makes rocks. But there go a flock of crows. "Caw, caw," they say.

Blanche. — They go fast. They are all black, and flap their wings slowly.

Esther. — I see them go to the sea-shore early every morning and back. They get their breakfast there.

Willie. — They eat the dead fish on the shore. I saw a crow's nest last fall, but it was so high up in an old pine-tree, without any but top branches,

I couldn't get it. It was made of great sticks and hay. You could see it far off. By and by they will come to the corn-fields for food, and the farmers will have to set up the scare-crows.

Teacher. — He belongs to the Corvus family. His nest is always high above the ground, in a pine or cedar, made of sticks and dry grass, — as Willie says, — and lined with bark from cedars or grape-vines. The old cedars at Nonquitt are all stripped of their bark. They make their nests the last of March.

Prescott. — Rob Moore got an egg for our club ; it was green, with brown marks on it ; about an inch and a half long.

Teacher. — If you should go near the nest while they are building, they will fly about, cawing in such a way as to deceive you about its situation. But when they are sitting on the eggs they are very brave. In April they eat a great many destructive insects in the ploughed fields, so that they do the farmers as much good as harm. Sometimes they will eat field-mice or snakes, and in autumn they eat berries and grain. Did you ever see a crow walk ?

Madge. — Yes, they look so tall and funny, as if they were going to meeting ; but they fly as if they were sailing, sometimes.

Teacher. — We are coming to the pines. Here are the willows. Don't break them to-day ; wait a week or two till the pussy-buds are larger, and we will examine them then.

II.

It is a lovely day, and the sweet, mild air reproaches us for keeping indoors. However, as Madame Monet comes for an hour, the class is easily reconciled to the confinement, which is made so entertaining by the *comédie* "Les Caprices de Gizelle" — *la petite méchante avec sa poupée*. But when the hour is through they seem tired, and Nature invites us away, so the rest of the session shall be held under the blue skies. We start joyfully, with microscope and specimen boxes, reaching within fifteen minutes a quiet road stretching between fields and woods, with a running brook near ; while stone walls divide the landscape, and broken rocks are strewn along the wayside.

As we ramble pleasantly on, we observe the cumulus and cirrus clouds freshening up the sky. We point them out, and explain their causes and effects, answering many a curious question thereupon. We might amplify on such a theme, but try to stop short of confusing them, and promise them more complete instruction another time; but it is an interesting subject, especially to the imaginative children. We observe the enterprising robin and bluebird, crossing and recrossing the airy spaces; and, with a clatter of tongues, we recount what we learned of them last spring,—how many feet of worm each young robin must have per day, the eggs, the nests, the songs, the migration and habits. They have not forgotten a word of it, and love to talk about the pretty creatures who can do what we cannot,—track the breezy air.

We have pointed out the trees that ornament the streets and grounds we have passed,—the maples, elms, and chestnuts,—and here are the pines, oaks, and willows. Do we not know much of them already? Let us look for the buds, find the fresh green layer beneath the bark, see the catkins coming out; and, as we have within a few

days had oral lessons on such opening buds and flowers as could be obtained, we examine, with renewed delight, the pistillate and staminate flowers of the willows wrapped in amber clouds, and the red maple all aflame on the borders of the wood. We find the sprouting maple keys and the acorns, with their stored-up albumen to feed the germ.

Now we come to a halt, and sit down upon some big stones, while we cast our eyes around. The broken rocks glisten with mica, and are beautifully variegated with feldspar, quartz, and porphyry; we split off flakes of mica; we talk of forces, of heat and water, of crystallization; we go back to primeval ages: here are boulders of granite and syenite. (Oh, yes! we heard of syenite in our study of Egypt last winter.) Is it too much to hint at the origin of these bones of the earth, and stretch these little minds to such vast themes? You can see their powers expand, their imagination take wing, and their longing grow mightily as they look and listen. Ah! why are there so many mines of interest in our track to-day, and the road below and around us so teeming with material for investigation? It was not in

our arrangement of opportunities ; let us accept it as part of a wiser one than ours.

“Well, now, scatter, dear children, and find all you can ; I await you here.” Away they go to the four quarters of this field of exploration. Alice H., the born naturalist, starts for the brook, with three or four younger ones loyal to her ; into the woods goes Hattie with a troop, and the radii of our circle are quickly drawn by swift detachments—to the fields, down the road, on to the recesses, where the sound of the pines is heard or the clear gurgle of the water. They come back, after a while, in irregular squads, and lay their treasures on a big flat rock together. Here is a blossom of cinquefoil, with its plaited leaves and running stem ; sprays of alder and willow catkins, in every stage of beauty ; clover leaves ; one little stem of epigea in bloom ; fresh grass, and a great variety of lichens and mosses. One and another explain and describe the cinquefoil and epigea, when,—hark ! a shout of glad announcement from the woods, and a burst of rosy cheeks and bright eyes ushers up Alice T. and her followers, with four dangling snakes, all shining and scaly, one with the forked tongue still

darting from its bruised head. What beautiful golden browns checker its swaying length! We will carry them home, and have a lesson on them to-morrow. So must we also teach lichens and mosses, although Alice T. tells us now of the crumbling of the rock under the lichen; but while we wait for the delaying parties, who have not returned, we are diverted with an account of the adventure of the snake discovery and capture, and have time to look through the microscope at the lovely mosses—miniature forests of green, crowned with whorled roseate heads; soft carpets of verdure, lifting up their spears and cups of red and brown.

But now we hear the clarion call of the scouts from the brook, and on they come! A raid over the stone wall brings them all to our feet, and lo! in their open boxes displayed are masses of bull-frogs' and turtles' eggs,—the embryo just beginning to show the line of cleavage. What excitement of pleasure attends this lesson! We are not afraid of embryology: nothing is more interesting than this evident miracle of the birth-hour of Nature—both animal and vegetable—and we are in the very midst of its awe and beauty.

We discuss carefully and explicitly, with the microscope, the bull-frog's eggs, the albumen, the germ, the tadpole. They all know the metamorphosis and the general characteristics of the tadpole and frog. But Alice H. has been an original investigator: she can tell precisely the succession of the changes, from the laying of the egg to the full-grown frog; she has felt in the bull-frog's mouth herself to see if it had teeth, and she tells us all about it, and how its tongue is attached in front and free behind. They have all seen the toad or frog throw out its fat, gluey tongue to swoop up the ants or slugs; some have seen the bull-frog swallow another frog; but they are far from listless when they learn for the first time that the frog's ears and nose are in the back of its mouth; it doesn't appear to strain their faculties to learn, from once hearing, these and many other facts about the frog, in this academic hall, with the specimens under their eyes.

We cannot find a frog, but many remember the tight piece of skin stretched behind the eye, which is the drum of the ear. They hear of the flying-frog of Borneo; of the haughty male frog, who decorates himself with a garland of eggs

till he looks like a Knight of the Garter, and then sits in the mud till the tadpoles squirm, when he jumps into the water and they all launch out like an epitome of the resurrection day ; they hear of the toad whose back grows soft and spongy while it lays its eggs, so that the male can stick it full of the little globules, like a beaded cushion, and when the change comes, in the twinkling of a toad's eye, one hundred and twenty lively little blackies jump out of their warm bed at once. It doesn't take long for the audience around the rock to commit these wonders to memory. Shouts of delight reverberate, and ecstatic measures of jumps and twirls and other gymnastics interrupt the lesson. Afterward in the more orderly attention of the schoolroom, we can fix the technicalities, explain the structure, compare and classify, and when abstracts have been written, I doubt if some of them may not lay claim to the rare title of Batrachologists.

It is high time to go home. Pick up the specimens, fill up the boxes, swing the snakes along ; do not get too many rocks, though they are so tempting in their glistening beauty and their wonderful suggestions ; and when we reach the

school, after our two hours out, we will hang the snakes from the window as trophies, and study them up for our lesson in the morning. Good-bye; we have started up many a trail; we long and mean to follow each one; and just now we are hungry.

CHAPTER VIII.

READING TO THE CHILDREN.

THE teacher seems to be reading to the class ; she looks up often to meet the row of intent faces turned toward her, and seems to gather inspiration from the review ; scholars at work upon other studies one by one lift up their dilated eyes, and as the reading progresses the whole school becomes absorbed in listening. Sympathetic and enthusiastic exclamations break from their lips here and there,—questions and brief conversations interrupt only to augment the interest. The book is held in the teacher's hand certainly, but if one glances over its rapidly turned pages he can hardly follow, and seldom finds the place. Actually, the text is translated impromptu into a style and language which, by a sort of improvisation, becomes the best medium for this mercurial transmission of ideas. The book is taken as a skeleton to be clothed upon by the kindled in-

spiration of one who loves herself to prepare the mental aliment for those whom she has studied so carefully, and whose hungering looks turn to her, while she is stirred by their magnetic desire, and sensitive to every throb of the nervous tissue of their busy brains.

It is better for such a teacher to take for this purpose a book which is not written for children, as children's books are too childish in style and too limited in language. Words thrown into strong connections interpret themselves to the warmly interested mind, and the vocabulary is insensibly and actively enlarged, the store-house of memory filled, not with dead forms but with living actors, ready to step forward and play their part whenever the automatic brain calls for them.

This method of teaching explains much that seems extravagant as a statement of a year's work. For example, one day last spring, to reward those who had braved the storm to come, I took a dry account from a compendium of general history, and attempted to teach in an hour or two the lesson of the Crusades. The children had had but a glimpse of the matter, in connection with their lessons in English History, the previous

year. Reading to them in some such way as I have described ; writing on the board a schedule of names and dates as they occurred in the reading, in order to make the outline clear before their eyes ; tracing the localities and movements on the map ; reading verbatim passages from the *Talisman* also, showing with it the engravings from a rare illustrated edition of Scott, and with pictures and a little of the text from *Ivanhoe*, — I found at the close of the session, that in the glow of the whole theme upon the clear mirror of their minds, they had received a comprehensive as well as a particular knowledge of the subject, a perfectly orderly outline of its facts, a vivid apprehension of its purpose, philosophy, connections, and results, as well as a strong scenic impression of the drama of the whole epoch. I think it would have taken a week, at least, of daily lessons of common book-routine to accomplish what we did in this reading ; and I believe the pupils will have a more enduring remembrance of the history, and a stronger desire to inform themselves more fully upon it, and to revive whatever escapes their memories, than they would have after the usual method of study.

Plutarch's Lives we read much in connection with the study of ancient history ; it is a wonderful mine of delight, and absolutely requires this kind of presentation. There is much elimination and supplementary explanation to be made, — deep chasms in the historical highland to be bridged over, and, in fact, a great deal of transmutation to make it into pure gold for children ; but, with this handling, it is fascinating in the extreme, and throws out the old heroes most boldly on the canvas. “ Splendid ! ” “ Three cheers ! ” “ Which do you like best ? ” “ Oh, how I admire him ! ” are among the frequent interpolations on the part of the excited audience, as they are moved to sorrow or to joy by the grand sculpturing of this great master of biography.

But if they take the book and try to read it alone they are disappointed ; it seems incoherent, often very prosy and unintelligible, and they grow weary of hunting for the juicy plums of anecdote.

I like to take a hand-book of some branch of physics, and offer it to the class through this kind of reading ; the “ primers ” in these branches I do not care to use, although I have tried several of them ; but they trammel the natural action of

my own thought and flow of my own expression and clog the ways which run from my mind to theirs. It seems almost impossible for me to read one of them verbatim to a child. A little of that electric force of the teacher's own individuality, when it beats in harmony with the pulses which it touches every day, is more effectual than volumes of dead words and tedious reiteration. More than all that they learn of the subject-matter in hand in such exercises, I value the sharpening and strengthening of their powers of discernment, concentration, and assimilation, and the steady improvement of the quality and fibre of the mind which is ministered to. Is it not the essential germ of true education?

CHAPTER IX.

ORAL LESSONS.

SOCRATES sat with his disciples in the Academe as a teacher *viva voce*; no book was in his hand, no tablet or scroll was held out to his pupils, but the air surged with the magnetic power of his presence, and the audible expression of his mind. The eye was riveted on *him*, not on written pages or slow-conned letters. And in the immense concourse of the Greek theatre we see the people listening with bated breath to the wisdom, the philosophy, the history, and religion of those great tragedies whereby Æschylus, Sophocles, and Euripides informed the world. Was it necessary for any open-mouthed listener to go thence to the examiners, or to work over those problems of passion and reason by the smouldering embers of a printed record? Nay, the impression was branded into his mind by the heat of

action, form, look, and speech, which kindled there an undying fervor.

And, — to come down to nearer times and less miraculous men, — when did Agassiz call his class before him to go through a list of printed questions reviewing a printed page? He took them to Lake Superior to learn of ores; the masses of copper shone iridescent in their hands, and the teacher's face glowed with the enthusiasm of vision as he spoke and pointed. How many times have we seen him on the platform imparting more wisdom, science, and devout learning from his expressive and radiant face and golden utterance than could be put upon paper or held within covers! He adjured the young priests and vestals of nature, gathered about him at Penekese, to discard books and proceed to discovery. Books are the reservoirs of what we have not the means of hearing or seeing. If I am a cosmopolitan, need I consult the geography? If I can listen to the animated report of the cotemporary of great men, need I read their biographies? No; the word, the look, the first-hand report, is next to the witness of our own eye or the participation of our own life.

Even in consulting the book, how greatly instantaneous impression may be cultivated! The dull, untrained mind follows each line with heavy movement of eye and brain, and even of lips; the brain trained to concentration and rapid assimilation takes in the page at a glance, as did Lord Macaulay, and receives the subject like a sun-picture in turning the leaves. I claim that one of the finest results of steady and progressive oral instruction is this training for concentration of mind, and instantaneous focussing of the light of the printed page, or any other channel of impression; it opens the ways, and arouses the forces of the brain, until that receives and appropriates whatever is offered to it without the friction of intermittent interest, and the check and chafe of an uneducated eye and brain. We have been accustomed to follow and catch the fleeting word which may not be recalled or repeated, instead of a waiting line to which we again and again recur when we plod through the dull letters until our brains are callous and rusty for want of exercise.

Horace Mann! Has any one any merely book-associations with his teaching? It was too vital

and incisive a matter to clothe with another man's language, or be imparted through any written medium. He said, "Let there be!" and there was. Truly it led us thirsting and hungering to every source of knowledge, — books were its tributaries, and so was everything wherein lay food for the insatiate brain stirred by his touch; but the great stream, — the deep river of his influence, was an outflowing of his own personality and his own inspiration, and created scholars and noble souls.

Oral lessons! they should come from the overflowing beaker, not from the scanty cup. If mechanical, what an utter failure they become! They must be so spontaneous as to awaken an interest in every pupil, so well prepared for as to satisfy the aroused attention; so replete as to tempt and reward all mental craving; so suggestive as to start innumerable activities in the listening brain; and so forceful and inspiring as to drive to investigation, research, and study, by every available means. They should be mixed with every recitation, — an infiltration of sunlight over every path of knowledge, shortening and illuminating the road, and yet revealing an infinite vista.

ORAL LESSON ON BIRDS.

Teacher. — Do you know that during this month a great multitude will come up here from the South, to spend the spring and summer? We shall soon see large and attractive parties of travellers arriving and settling themselves in their summer homes.

Scholars. — Who are they, and what are they coming for?

Teacher. — You must try to guess; they do not come by railroad or steamboat, although they travel as fast. They are coming now in such troops that there will soon be a million of them in Massachusetts.

Louie. — A million! What shall we do? There will not be room enough for them, nor enough to eat.

Teacher. — Oh, there are a good many of the houses they had last summer waiting for them, and they will go right to work and build all they need besides. As for their food, it has been kept safe all winter for them in little sealed cans which they know how to open, hidden in the places where they resort. I saw a crowd of them yesterday,

dressed in brown and dull red, opening some of the cans and eating the preserved fruits, and they had ices and frosting with their dessert, laid out on elegantly spread tables, supported and festooned by evergreens, spruce-boughs, and fir-boughs, and they had drops of balsam and spicy gums for their confections.

Bertha. — Why, Mrs. — ! what are you talking about ?

Teacher. — I'm talking about the delightful company about to visit us from the South. They know more about some things in Nature here than we do, and they are all more or less musical, and will give us quite a concert every morning and night, and more or less through many days of the spring and summer.

Carrie. — I think I know. May I tell ?

Teacher. — Not quite yet ; but you may talk about them, without telling. Do you know how their houses are built ?

Carrie. — Some of them are made of mud and sticks and straw and hair.

Teacher. — Do you know what they like best to eat ?

Carrie. — Worms. (*Laughter.*)

Several. — I know. It is the birds.

Prescott. — I saw a little bird standing on the top of the snow, the other day. He took hold of a little stalk that peeped out of the snow, and shook it till lots of seeds fell down on the snow, and he ate them. Were they the food in the sealed cans?

Teacher. — Yes ; the cans were hung up on that little stalk till he should come to get them. That little bird, and his relatives, had stayed here all winter, I think. How did he look?

Prescott. — He was black and white, with a big head for such a small bird ; and he almost turned somersaults upon the fir-tree, and hung with his head down.

Teacher. — Was his head black, or white?

Prescott. — His head was black, and his breast was almost white.

Teacher. — We might call him Black-cap. Did he seem to be alone?

Prescott. — Oh, yes ! call him Black-cap. There was a whole flock of them in the bushes, in the yard where those pink berries are.

Teacher. — Who knows his name?

Edith. — Was it the Chick-a-dee-dee?

Teacher. — The Chick-a-dee. That name is for his song; his other name is "Black-capped Titmouse." "Titmouse" is his family name. Have you all heard him sing?

Several. — Yes, indeed, we all know Chick-a-dee-dee.

Teacher. — He stays here all winter long, and we like him; why, Carrie?

Carrie. — Because he is so funny and nimble.

Lulu. — And so gay and not afraid.

Prescott. — I think, because he hops about the yard and gets the crumbs we throw him, and perks his head on every side and winks his eye at us.

Bertha. — Don't you think it is more because his song is so cheery, and he stays all winter?

Teacher. — You are all right. Hear about his nest and his eggs. He finds a snug hole in a post or tree, perhaps in a birch-tree, and lines it with soft feathers, or moss, or wool; then the last part of May is chosen as the best time to lay the eggs, — six little spotted eggs. Many of them go away farther north in the summer, and those who stay here are more shy, and keep more at home in the trees, where they pick out little bugs and insects' eggs from under the bark of the tree, as the Wood-

peckers do ; then in the fall they are as lively and merry and social as ever.

Mabel. — I guess they are modest about their plain clothes when all the other birds are here.

Teacher. — Now, here are two eggs of the Chick-a-dee, and a picture of him, which Louie may draw on the board. Tell me his other name.

All. — Black-capped Titmouse.

Teacher. — But these birds were not of the hosts I spoke about, flying from the South, coming now, and all through March. I mean a larger bird.

Helen. — Robins. They are the ones that eat worms, and make mud and straw nests.

Teacher. — You are right. Where do they make their nests, Helen ?

Helen. — Up in the apple-trees, in a corner by two or three branches. They plaster mud all in the place, and poke sticks around in it for a foundation. I have got one at home.

Teacher. — Here is one. It had to be pulled off of the boughs. See how strong it is, and rough outside ; but is it rough inside, Ethel ?

Ethel. — Oh, no ; it is all lined with soft hairs and feathers, for the eggs to rest on.

Teacher. — What is the color of the Robin?

Hattie. — I believe it is gray and brown on the top, and deep red underneath.

Teacher. — I want you to watch carefully, and be ready to describe exactly the color and form of the Robin. You will be sure to see some of them within a week. Notice the color of his head, his bill, and legs, as well as his back, tail, and breast. See whether his tail is forked, and whether he jerks it or not. Watch whether he runs or hops, and what he eats. Hattie, you may draw and paint a picture of him for us to see; and who can bring his eggs?

Helen. — I can; they are lovely in color.

Teacher. — Yes, so lovely and so peculiar that we can only call it Robin's-egg blue. How many eggs are usually in one nest, and at what time of year?

Helen. — Four or five, in April. We only take one or two eggs out of a nest, and we don't take the nest till fall. Oliver and I got them.

Carrie. — I wish you could see them, Mrs. H., on our lawn, tugging at the worms, switching them out of the grass after a shower, and then biting them in short pieces, and flying off with a tassel

of worms hanging from their bills. They hop, and look around, and hop again ; then they run so fast you can't see their legs go, and then they make a dive for a worm, and jerk him out by degrees ; it is so funny !

Helen. — I saw them, last year, feeding the little birds, in a nest up in the big spruce-tree, right out of my chamber window. The young ones peeped and peeped, and crowded up, and opened their mouths as wide as all out-doors, while their mother and father kept coming with worms to drop into their big mouths.

Teacher. — How much worm does one little robin eat in a day ?

Lulu. — Oh, I'm sure I don't know.

Teacher. — A man tried it once ; he took a young robin out of the nest and fed it all day, and it ate fourteen feet of good, fat worm, — as much as if you should eat forty chickens, at least. They are greedy little creatures. Think what a number of worms are made only to feed the young robins every year. Are the robins of any use to the farmers ?

Mabel. — I don't know. I should think they did harm, for they bite the cherries and strawberries,

and spoil nearly all of ours; and in the fall they bite the ripe apples and pears.

Teacher. — True; but, for all that, they benefit the farmer much more than they injure him. They eat up myriads of destructive worms and caterpillars and bugs which would spoil much vegetation and fruit. Do they rise early, or late, in the morning?

Bertha. — Oh, very early. I think they must get up before daylight, for they begin to sing just when a little faint streak of dawn comes through the window.

Teacher. — They are up by half-past three. Who can describe their song?

Mabel. — I know just how it goes. It is a little sad at night, but very musical, I think.

Teacher. — I am glad you have noticed it. Has any one heard their call to their mates, or their chirp to the young ones?

Maggie. — Yes, indeed; when they try to get the young ones to fly, they chirp all the time.

Ethel. — In the elm-trees, on our street, you hear them all day long, in June, and it sounds like a jolly chatter.

Teacher. — Their family name is Thrush. They

are coming toward us now, flying quite high, in merry companies, from the South. Soon the Bluebirds will start, and fly still higher, singing loudly and clearly on the wing,—the prelude of the spring to the snow-bound North. Watch for him, and tell me of his size, his color, and his habits, when you see him.

Bertha. — I saw a whole flock of them alight on the telegraph-wire and fences and trees around, as I was driving yesterday on the Acushnet road. They did look lovely ; so blue, and such a pretty blue !

Teacher. — They want some nice holes, or bird-houses, or boxes, to live in. I hope they will find them and get sheltered soon, for we shall have some bitter cold days yet. Is the Bluebird's egg blue ?

Helen. — Yes, light blue, sometimes white. I will bring one to-morrow.

Teacher. — Now, for a while, the Bluebird must eat berries ; but later, bugs and beetles. It springs from the twig or perch, and snaps up the flying insect in the air, or the beetle and grasshopper from the grass. Has it any color but blue about it ?

Lulu. — It has a kind of red breast, and partly white underneath.

Teacher. — It comes in March, sometimes in February, and builds its nest in April. It lays its first brood of eggs in May, but it often has two or three broods in the course of the summer, and they eat up myriads of insects. They go away again in October. Their song is sweet, but a little sad. Now they come flying on their long journey through the windy sky, singing as they come. How do you suppose they know the way?

Hattie. — That's what I always wonder.

Teacher. — So everybody wonders. I read a long article in a British magazine, the other day, upon the migrations of birds, but it did not solve the riddle, to my mind. Many people think the birds have a way of knowing things, so different from any way we know of seeing or hearing that we cannot understand it,—another sense which guides them; others think they learn the road by their keen sight and hearing, and that they have a regular track, which each generation of birds teaches to the next, and on which they have signs or guide-posts for following. Great flocks of birds that go from Africa to Europe, every year, cross

the Mediterranean at the same places, by just the same routes; one across the Straits of Gibraltar, and two others farther east. But we can't understand the birds as they understand each other. God takes care of them, and shows them in some way what path to take. Now, Carrie and Maggie, repeat together the last verse of Bryant's poem, which you recited in concert yesterday; and all be sure, before our next lesson, to observe the birds as they arrive.

Carrie and Maggie. —

“He who, from zone to zone,
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone
Will lead my steps aright.”

ORAL LESSONS IN BOTANY.

I.

Teacher. — Close against our windows comes the bough of the Birch-tree which grows in the yard. See! its twigs are all naked except for these little buds, and yet, in three weeks perhaps, it will be covered with the prettiest little green

plaited leaves. I will break off a twig for each of you, and you may tell me what you observe upon it. What color is it?

Ethel. — It is dark brown.

Teacher. — Yes; it is the Sweet Birch. Taste of the bark.

Ethel. — It is good; something like Sassafras. I thought the Birch-tree had white bark.

Teacher. — The White Birch has; this is another kind of Birch. They are alike in the kind of flowers they bear, and the kind of leaves, and in the twigs and bark having this spicy taste, also in the way the outer bark will strip off in thin layers. How do the leaves grow on the stem — opposite or alternate?

Sylvia. — They are alternate. Do they always come so, Mrs. —?

Teacher. — Yes; the same plant never varies in the arrangement of its leaves on the stem. Look out of the west window at the Maple-tree. How do those buds grow on the stem?

Gertrude. — They are opposite; and the twigs are opposite on the branches.

Teacher. Those buds are flower-buds on the Maple. On the Birch they are leaf-buds. Now

remember that flowers and leaves grow either opposite or alternate on their stems, in most cases, but in a few they are set right around the stem in a sort of ruffle, — they are whorled. Opposite, alternate, and whorled are names for the manner in which the leaves or flowers are arranged on the stem. Repeat it. But look again at your Sweet Birch stem. Scrape off a little of the brown bark. What do you see now?

Louie. — A nice, fresh, green skin. It is damp.

Teacher. — Pull that off. Now what do you find?

Maggie. — The wood. It is a little wet, and very smooth.

Teacher. — Look at the ends of the twigs where they were broken off.

Carrie. — Mine drips with water.

Teacher. — That is the blood of the tree; the sap which runs through its veins and cells, and will build up the twig, and turn the buds into leaves. The little green inner bark has kept food for the tree stored up all winter, and now the sap is beginning to rise from the roots up through the wood, and both together provide nourishment for the buds, and, as they absorb it, they make more

and more cells, and grow from buds to leaves. How do you think the sap gets up so far? All this hard wood is made up of the hard cases of long fine boxes or cells filled with sap. The roots of the tree suck up from the ground, as soon as it is soft, moisture and particles of plant-food, and this is carried from one cell to another, through little pores in the partitions at the ends of the cells, oozing up and mixing with what is already there, running through the veins quite fast, now that spring has come. See how the ends of the broken twigs on the tree drip! How fast all this food will be made into the pretty, plaited leaves you will see day by day. The tree is working very fast with all its machinery of cells, roots, sap, bark, and buds. Now open the bud, and tell me how it is put together, and what you find.

Mabel. — It has some sticky leaves or brown scales outside. Then inside are little fine folded-up leaves, folded up something like a fan, all crimped and plaited—oh, so fine! all folded alike, with little pointed edges. Isn't it pretty?

Teacher. — In a week we will examine the leaves more carefully. Do you see any marks on the stems, below the leaves?

Lily. — There are some smooth, flat places. What are they?

Teacher. — They are the places where last year's leaves came off. The *scars*, we call them. When you find a Horse-chestnut stem or twig, notice how large and plain the scars are. The leaf fell off in the fall, you know. Do all plants lose their leaves in the fall?

Madge. — No; the Pine-tree does not.

Alice. — There are some trees over in that yard that are green all winter.

Teacher. — The Spruce and Hemlock, and all trees called Evergreens, keep their leaves, and form new twigs with new leaves on them at the end of their boughs each spring. The trees all form that inner bark fresh every year, and it saves up the food for the new parts to grow with in the spring before the roots can get much food from the frozen ground. The sun, becoming warmer, sets all the growing machinery at work. The inner bark, soft at first, grows hard by the end of the summer and another inner bark is formed over it, so that, as every successive year this layer of bark is made, it always shows a line of separation between it and the outer layer; and when you

saw off a tree horizontally, on its trunk you see the rings all around the centre quite plainly. In this way, one can tell how many years old a tree is.

Holly. — Will all these buds grow and open?

Teacher. — Perhaps not. Some may die and fall off, if the sun doesn't shine directly on them. The frost may come and kill some, or a little worm or insect may eat others. The leaves will not probably be quite as regular and many on the twig as these little buds. Now, do you want a hard word before you go? *Exogenous* is the word. This is an exogenous stem; it grows by adding every year to the outside of the stem. So do all our trees; but the Palm-tree or a corn-stalk or a cane, and others, grow by adding to the inside of the stem, which looks like a large bundle of fibres, new fibres or threads each year. They are *endogenous* stems. Endogenous stems have no branches, but all their leaf-stems come out at the top of the stalk. Exogenous stems have a pith or soft part, of cells in the middle, wood around it, and bark outside, and they have many branches, a new set every year on the whole length of the stem.

You have now learned the peculiarities of the Birch-stem, the arrangement of buds in three different ways upon different plants, the growth of the bud just above the scar of the last year's growth, the way in which the buds are fed while the ground is yet hard, the formation and method of growth of this branch and most trees, and the distinction between the exogenous and endogenous stems. Bring any budded stem or opening leaves, or any other subject for explanation about plants to-morrow, and we will examine it ; and, at all events, in a few days we will look again at our Birch leaf-buds, and our Maple flower-buds, and see what we may learn about them. Bring a Horse-chestnut stem budded, if you can.

Teddy. — I can, and a good many other stems, too.

II.

Teacher. — We have come into the green-house to study the climbing-plants : we must look to see how they climb, what parts they have which are for only that purpose, and how those parts do the work of climbing for the plant, to lift it into the warmth and light. Some of the climbers you know

very well by name. I see several vines of English Ivy; I want you all to look closely at them to see how they climb the wall or trellis they are upon.

Louise. — This one seems to stick tightly to the wall.

Bertha. — They have little roots which go into the cracks.

Teacher. — Where do those rootlets come from?

Ethel. — Out of the stem on the side next to the wall.

Teacher. — Do you see any which have not attached themselves or taken hold of the wall?

Edith. — This vine has lots of dried threads hanging from it; are they the roots?

Teacher. — Look at Edith's vine which is running along the wire. The rootlets are all hanging withered from it because, having searched in vain for something to cling to, they have given it up, and died of uselessness.

Hattie. — How do they know anything, or feel about of their own accord?

Teacher. — That is a hard question to answer; so you will need to use your eyes well, and try, by the time the lesson is over, to answer it yourselves. If you could watch these little roots which put

out from the stem, you would see them feeling about for a deeper cleft or a more uneven surface, and when they find it they stop, and their ends flatten into little disks like saucers, which hold on just as a leather sucker holds on to the surface you apply it to. Bring the microscope and look carefully at them; see the disc which holds this rootlet fast.

Maggie. — It is like the snail's foot.

Carrie. — It is like the sea-weed, where it fastens to a shell.

Teacher. — Does the German Ivy climb so? Look at this on the trellis.

Louie. — No, it twines around. I think the German Ivy is prettier than the English; it is greener and more delicate.

Teacher. — Yes, but in England, where the climate is warmer and moister in winter than here, the English ivy is greener and fresher, — not of the sombre, dark green and brown that you always see here. In New Bedford the English ivy thrives better out-of-doors than in most places in New England. Where does it grow most luxuriantly here?

Bertha. — On Mr. Allen's house, and on the

stone cottage on County Street. Oh, Mrs. H., I threw a snowball up to the ivy on the side of Mr. Allen's house, the other day, and out flew the greatest flock of English sparrows. I wish you could have seen them. I didn't know there were so many in town.

Teacher. — Well, that is good ; the ivy shelters the birds ; perhaps the birds reciprocate by eating up the bugs that might destroy the ivy. There is a great deal of mutual help in nature. But have you observed more carefully how the German ivy climbs ? Ethel, you tell us what you see.

Ethel. — I see it twisting around the wire by its stem.

Teacher. — All tell me whether it is by the leaf-stem or the main stalk.

All. — By the main stalk.

Gertrude. — The stem is all kinky trying to get around.

Hattie. — How does it get around ?

Teacher. — I will show you before we go. Look at the Nasturtium vines ; how do they climb — by the main stem, or by the leaf-stalk ?

Alice. — This one holds on by its leaf-stems. Just see how funny those stems look that have

not got hold ! they are bent right up, and have turned a square corner.

Teacher. — That is to push the pretty, shield-shaped leaf up with its face to the light ; as it is clinging to a horizontal support, it has to turn the stem around suddenly to accomplish it. Do you all see how it twists its leaf-stems around the string, and how the plant climbs in that way ? This, now, is the third way in which we have seen the plants climbing, since we came in. Here is the Passion Flower, whose leaf-stalk is long and much twined.

Helen. — Do just come to see this lovely vine ; what is it ?

Teacher. — It is called *Campsidium Filicifolium*. It has no common name. I admire it, it is so delicately beautiful. What does it remind you of, Hattie ?

Hattie. — I have seen ferns which look like it. Its leaf is more finished and elegant, I think ; don't you, Mrs. H. ?

Teacher. — Yes, it is a kind of fern, and its leaf much like the frond of the fern ; but every part of its compound leaf is as perfect as if it were the only thing the spirit of the plant had to express

itself in. Look at this fine, tapering point of the stem reaching up from the line where it climbs: it goes round slowly, seeking its orbit, and makes the circuit in just the time nature has appointed for it: by to-night, perhaps, it will have reached this side and will point opposite. It is twining and twining, while its leaves unfold to grace the air and adorn the trellis. It twines by its main stalk, like the German Ivy, and the end looks almost like a tendril, but it develops leaves and buds as it grows. Come with me, I want to show you a vine with compound leaves, where the mid-vein spins out into a long, slender tendril. Here it is. It would be hard work to disentangle the leaves. Look and tell me about it.

Louise. — It has a compound leaf, and it is fastened at both ends. — by one to the stem, and by the other to the trellis.

Teacher. — Are the tendrils straight, or curled? (Some answer "Yes" and some "No.") Are the straight tendrils those that have begun to twine or not?

Maggie. — Oh, isn't it queer! they are straight before they get hold of anything, and curled all up tight afterward.

Teacher. — The long, straight tendril sweeps its point around till it finds a chance to cling; then, being so long, the leaf is a good way off, and so the tendril begins to coil between the support and the leaf, to bring the stalk near its support. Does it coil one way exclusively?

Helen. — Oh, no; it goes on the same way for a while, and then turns round and goes the other way, — just like the reverse waltz. What is that for?

Teacher. — Do you all see it? Would it not twist the stem too much if this were not so? It is an ingenious device. It seems as if the tendril thought about it. Did you ever see the grape-vine tendrils do the same?

Bertha. — Yes, indeed; I know just how they look. How can they do it? Are they creatures to know?

Louise. — Do you remember about that Murderer Vine in the Amazon forest, that you showed me a picture of?

Teacher. — Yes, I do, and so do you all.



III.

Teacher. — We spoke of the Birch-tree storing up its nourishment for the early leaf-buds, in the inner bark. Nearly all plants save food in some of their parts for the next year's growth. This is what seems to me a proof of God's presence in it and care for it, — the *Providence* which we use as a name for God. Here is a little plant living almost wholly upon that food provided last year for its growth this year. What is it?

Class. — It is a bean growing in water.

Teacher. — The split bean is really two thick leaves, which serve as food for the plant which is growing up from the little bud or germ that was set between them like a little tooth. That little germ was the real seed, and sent down these roots, and sent up this stem which is opening into buds and leaves. Tell me of other plants that will grow so in water living on its stored-up food for a while.

Mabel. — The Flax-seed will. I put some cotton-wool on the top of a glass of water, and in a week or two the glass was filled with delicate

rootlets and the light green stems and leaves grew up, with afterward a gentle blue flower here and there among them.

Sylvia. — I have some Hyacinths in bulb-glasses, and they are all in bloom beautifully in my window.

Teacher. — Where have they found the food which has nourished them? The bean, you see, is gradually shrivelling as it gives up its food to the plant. How is it with the Hyacinth? Do you see any part which seems to be giving and fading while the plant is gaining all the time?

Sylvia. — It is the bulb that becomes less and less every day. It must be that which has the food.

Teacher. — Now, I believe, if you think, you can tell me how the bulb must have been formed. What part of the last year's plant might have been transformed into the bulb. Did you see that great Mexican plant in the green-house, the other day? I showed you the long leaves, so exceedingly thick toward the ground, and how as they thickened and packed themselves at the base, the upper part shrivelled and fell off. I have a bulb

which is just brought up from the cellar; what were all these layers last year?

Maggie. — Oh, were they the leaves?

Louie. — Yes; I suppose the leaves thickened and closed together at the base, and the tops withered and fell off.

Teacher. — Yes; that was the way the wise plant took to save itself for early growth another year. Here is another bulb which has sprouted in the warm, damp cellar, and much of the nourishment has already gone from the bulb to the new leaves.

Ethel. — What makes the leaves so light and yellow?

Teacher. — The want of sunlight, which gives the green color to plants. The celery is kept in a dark place or covered purposely, so that it shall be crisp and white. Now here is a turnip, a carrot, and a cabbage. Tell me, Gertrude, where they have stored their provision.

Gertrude. — The cabbage has stored it in the leaves. Is it a bulb?

Teacher. — No; because the whole leaf is thickened and made close and solid; it is a head. What is the turnip? Are there any signs of

leaves in it, or is it a seed with food-leaves like the bean?

Carrie. — I should think it is a root.

Teacher. — So it is; and do you know of any other thick root which not only feeds the new plant, but feeds us when we choose?

Edith. — Isn't the radish one?

Teacher. — Yes; tell me of some other bulb, Lily.

Lily. — The Lily is one; not I, but the Lily-plant, for I am saving some bulbs that grandmother gave me to plant in my garden.

Teacher. — Now, all repeat to me the ways we have discovered in which a plant lays up nourishment for the next year's plant.

Class. — Inner bark, food-leaves of the seed, bulbs, and roots.

Teacher. — The food-leaves are *seed-leaves*, or *cotyledons*; write the word cotyledons. Here are the cotyledons of the bean. The other day, in the green-house, we saw a large bed of little plants just sprung up from the seeds which had been planted in the ground. I pointed out the two leaves of each plant nearest the ground, and you saw how they differed from the other leaves; they were the seed-leaves or *cotyledons*. Watch

your Morning-glories and Balsams when they begin to come up in a month or two ; the seed-leaves are quite different from the true leaves. Are any of you going to have a garden ?

Class. — Yes, indeed.

IV.

Teacher. — A few weeks ago we observed the Maple-tree filled with flower-buds ; what have you seen since in the tree ?

Mabel. — You called our attention for several days to the tree, when it was all alive with bees gathering honey ; a swarm of bees in the sunny air flew back and forth between this tree and the one opposite.

Carrie. — Why did they go from one tree to another ?

Edith. — There were flowers on the other tree also.

Louie. — They always gather honey from one kind of tree or blossom at the same time, so as not to mix different kinds of honey.

Maggie. — Did it do any good for them to fly back and forth ?

Teacher. — Those who read in the *Fairy Land of Science* last term can tell us.

Ethel. — They got their backs and heads and legs covered with pollen-dust in getting the honey, and the pollen rubbed off of them on to the stigma, to turn into seeds in the ovary of the flowers.

Teacher. — Here is a flower, like most flowers, with the yellow dust of the pollen ready to fall on the pistil, which is in the middle of the flower. But examine now the flower of this Maple-tree, and see if you can find the stigma.

Class. — We cannot.

Teacher. — Now look at these flowers, taken from the opposite tree.

Prescott. — The stigma is in these.

Teacher. — See what kind, neighborly trees! One has the pollen, the other the ovary; and the bees and the breeze work and carry for them. In Nature all things help each other. Now on which tree will the seeds or the fruit grow?

Gertrude. — On the opposite tree.

Maggie. — Oh, yes; I remember all the Maple-keys that hang down red from some of the Maple-

trees, and then turn brown and fall to the ground and blow away.

Teacher. — Here is a Pussy Willow twig; how will this little furry bud develop?

Carrie. — Into a drooping spray of flowers called a catkin.

Maggie. — There are two kinds of Willow catkins: one is a spray of little light flowers; the other is more green, and less like a flower.

Teacher. — Can you guess, then, which catkin has the pollen, and which the stigma or ovary, and, therefore, the seed?

Louie. — The flowery catkin has the pollen, and the other the seed, I should think.

Teacher. — Have you ever seen the seed-catkin all covered with down?

Several. — No; that is green without the fuzz.

Others. — Yes; later the seed-catkin is covered with down.

Teacher. — When the seed-catkin has ripened, and the seeds are all ready to plant, they burst out into a feathery, white down. What for, Ethel?

Ethel. — Is it so that the wind will blow the seeds about?

All. — Oh, yes; like the Dandelion-puff and the Thistle.

Teacher. — You are right; like the beautiful Milkweed-seeds also. Now you see why the Maple-seeds are winged — for the same purpose. What is this twig? How very pretty! How should you judge this to be from an Oak-tree?

Dolly. — I should know it from the shape of the leaves.

Teacher. — What is the blossom?

Class. — A catkin. Six catkins in a cluster. and the clusters all around the twig, hanging below the leaves.

Teacher. — Do you see both pollen and stigma here?

Maggie. — There is no stigma in these flowers. Where are the seed-flowers, Mrs. H.?

Teacher. — What do you see close to the stem, below the catkins?

Carrie. — Little, cunning acorns, just beginning to grow.

Teacher. — What do you see at the point of the little acorns?

Sylvia. — I see three little stems or hairs.

Teacher. — They are the three parts of the

stigma, and when the pollen from the catkins falls, it is received by them and carried to the ovary, making the seed of the Acorn. Look, now, at these Horse-chestnut blossoms. Examine them with regard to the pollen and the stigma.

Hetta. — Mine have the pollen but no stigma.

Lily. — Mine have the pollen and stigma both.

Louie. — One of mine has the pollen and the other the ovary.

Teacher. — You all are right. Some of the flowers have both pollen and ovary; some have only stamens bearing the pollen, and, therefore, will have no seeds; they are the staminate or sterile flowers. Others have the stigma, — the top of the pistil which leads to the ovary, — and, therefore, bear seeds; so are called the pistillate or fertile flowers. Now tell me whether the catkins of the Oak are staminate or pistillate.

Class. — Staminate.

Teacher. — And how is it with the early Pussy Willow catkins?

Louie. — They are staminate, and the green ones pistillate.

Teacher. — The Maple-tree which bears the staminate flowers?

Class. — The one close to the window, and the opposite one has the pistillate flowers and the seeds.

Teacher. — There are, then, three methods of arrangement for the fruiting of the plant. One flower may contain both stamens and pistil like the Rose, and most of the flowers we see; or, one plant may have the staminate flowers and another the pistillate, like the Willow and the Maple; or, the same plant may have the staminate flower on one part, and the pistillate flower on another part of it, like the Oak and like the lovely Indian Corn, whose plume of staminate flowers waves on high, while its sea-green silk pistils are folded in their beautiful sheath below, waiting for the grains of pollen to seek its long, silky channels, and rest in its ovary cells, all to develop into the ripened rows of amber corn, the matchless beauty of the set gems of the corn-fruit. In the Chestnut we have a combination of all these methods. Using the technical terms, which we will analyze to understand, we find, therefore, the Monœcious form, like the Oak; the Diœcious, like the Willows; and the Polygamous, like the Chestnuts.

Mabel. — I think this is the most interesting

part of botany, to watch how the flowers make seeds.

Carrie. — It seems as if they all knew something; do they?

Maggie. — There must be a thought about it.

Teacher. — How sweet it is to see and feel that thought, and know that it is the same thought that is trying to act in our lives as easily and truly as it acts in the flowers!

CHAPTER X.

PRIMARY CLASS IN PHYSICS.

I.

Teacher. — Prescott, yesterday I saw you drawing Dick up Union Street in your cart. Was it as easy for you as to draw him down the hill?

Prescott. — No, ma'am; but I had to hold back almost as hard going down.

Teddy. — The cart goes itself down the hill.

Teacher. — Oh, no; something is pulling it down which you didn't see. Let go of that book in your hand; what made it go down?

Willie. — It is heavy.

Teacher. — What does *heavy* mean?

Prescott. — Hard to hold up.

Teddy. — It pushes hard.

Teacher. — There is a power of the earth which pulls everything toward it. It is called gravitation. You may all write the word. It makes things seem heavy when they push hard toward

the earth, or have much weight. Did you ever try to lift something which you could not lift, which was too heavy for you ?

Lottie. — I tried to lift Willie's boat, and it was too heavy.

Teacher. — The earth pulled it stronger than you could. The earth pulls all things all the time. Can you think of anything which will not drop when you let it go ?

Madge. — A feather will fly away, and a seed and leaves sometimes.

Teacher. — There is something you do not see which holds them up, although the earth still pulls them down. Who knows what ?

Maggie. — The wind blows the leaves, and the hot air will keep up any light thing over the register.

Teacher. — The air holds up everything, somewhat. A feather is so spread out, and there is so little of it, really, that the earth does not pull it down so strongly as the air holds it up, and the hot air pushes up still more than cold air. If you hold a piece of paper on the palm of your hand, your hand holds it up ; if you take your hand away, it goes slowly to the ground, because the

air still partially supports it, and its substance is so spread out that it gives a large surface for the air to support, compared with the weight of it, or the force with which the earth pulls it down. Now a great part of the force which men use is used in resisting this force of the earth, or in lifting things which are heavy. The other day I saw a man lifting very heavy bales into a high window in a warehouse. How do you suppose he did it? by just pulling them up with a rope?

Teddy. — I guess he had a pulley.

Teacher. — So he did. Show me what a pulley is; draw a picture of one on the board.

Teddy. — He had a rope fastened to the bale, and it went up over a little wheel which was fastened to a beam high up, and the rope hung down the other side of the wheel for the man to pull.

Prescott. — When he pulls down, the bale goes up.

Teacher. — That is a contrivance to make it easier to pull. Such contrivances are called machines. Did you ever see a man try to lift a rock which was too heavy for him, by any other machine? Prescott, if you had been with Lottie

when she tried to lift that boat, what could you have done to help her ?

Prescott. — I might have pried it up with a stick ; or, if I could have got a crowbar like that the men had to get those stones for the cellar up on to the truck, I could have done it easily.

Teacher. — Yes, the crowbar ; that is a machine ; a very simple one ; only an iron bar. It is like having a very long, strong arm, like a gorilla. Aren't you glad that God gave a man a mind to think of machines, and did not have to make him like an ape ? What other machines has man invented to help lift ? I will make this square to represent the heavy thing which is to be lifted. Here is a line for the string to lift it by. Now let us have it wind over this axle, which has a handle at the end for a man to turn. What does that look like a picture of ?

Class. — A well, and drawing up the bucket.

Teacher. — Yes, it is a machine called a windlass. It is easier to put the strength of a man, or of a horse, or of steam, or any other power upon turning that handle, or what is the same thing, turning a wheel, than it is to set it at work merely lifting. Now, in the pulley, which is a string run-

ning over a wheel, you can easily set some other force than man's strength at work. I will make this picture of the bale of goods, and the rope which lifts it running over the wheel. Now, instead of having a man pull the rope down, suppose I want a horse to pull it ; what shall I do ?

Teddy. — Make another wheel, fastened to the floor of the loft, and let the rope go round that, so that a horse can be fastened to it and walk along, pulling it, and back when he lets it down.

Teacher. — Suppose I can't get the horse up into the loft very well ?

Prescott. — Why, let him be down on the ground, and have the other pulley down there, and it will be all the same, — just as they do at the coal yards to load the vessels with coal.

Teacher. — Tell me of all the machines you have seen, for the next lesson. Write the names of them on a paper, and be ready to explain when and how they worked when you saw them ; and if you ever have something to do which you think at first you cannot do, set your wits at work to think of a way to get some other power to help you. Invent a machine to do your work for you. That is the way for a Yankee boy or girl, and

for every one who wants to accomplish much in the world.

II.

Teacher. — Here is the ash-cart, children ; there are three barrels full of ashes. They will be heavy for the man to lift.

Prescott. — I know how he will get them up. He will take the back-board out, and lean it up against the cart and roll the barrel up.

Teddy. — Then all the ashes will fall out.

Prescott. — Well, if they were flour-barrels, he could roll them up.

Teacher. — Suppose they were flour-barrels, why would he roll them up ?

Willie. — It isn't so hard to lift them.

Teacher. — The board partly supports them ; it is a machine ; it makes it easier to overcome gravitation, and adds to the force of the man. That board, or anything which gives a slanting surface on which a weight is raised, is an *inclined plane*. The meaning of the name is clear. Did you ever see a man chop wood, and then put a wedge like this (\triangleright) in the split, and drive it in to complete the separation of the wood ?

Madge. — Is that a machine?

Teacher. — What is each long side of it?

Ethel. — An inclined plane.

Teacher. — The wedge is a machine, then, — a double inclined plane. Will it split the wood across, as you might saw it?

Helen. — You have to drive it in with the grain.

Teacher. — Just as the axe goes in. Now what is the axe?

Frank. — That is a machine.

Teacher. — Is there any inclined plane about it?

Teddy. — It is just like a wedge.

Teacher. — That is true; it is a wedge with a handle for the man to use in applying the force of his muscle to drive the wedge in. What is the wedge used for besides splitting? You cannot tell. Did you ever see men raising a building or a ship?

Maggie. — I saw them launch a ship, and they hammered in under it to lift it. Were they driving wedges?

Teacher. — Yes; they drive great wedges in under the keel; if they drive a small one at first, then they can drive in a larger one afterwards, and so raise the ship quite off the ways to launch

it into the water. Sometimes to press things very tightly wedges are used,—to squeeze seeds together or fruit, to get the oil or juice. Wedges are used in many ways. I want to make a hole in this wood ; I cannot press a blunt end through it immediately, so I take a wedge which has an inclined plane all around it,—this pin, or a nail, or an awl,—and push it in ; the resistance of the wood is overcome gradually.

Gertrude. — I never knew that a pin is a machine.

Teacher. — What is a knife? Are not all sharp, cutting instruments wedges? Scissors are two wedges pivoted together. See, they work on both sides of what is cut, and meet in the middle. But what is it that keeps the wedge where it is driven? It might slip back, by the pressure on the inclined plane.

Teddy. — It gets pinched in.

Teacher. — It is friction which holds it ; the roughness of the wedge and the substance which it rests in act upon each other to hold it still, until some stronger force of driving is used again. If you use force to put a thing in motion, when does it stop?

Madge. — When anything stops it.

Teacher. — What stops a ball after it is thrown?

Teddy. — It falls down.

Teacher. — The earth stops it by gravitation, but it stops it gradually, because the force which started the ball yields gradually to the force of gravitation, and *something else*. If you should start a ball rolling on a plane, why does it stop? Will it stop sooner on a rough surface than on a smooth one?

All. — Oh, yes.

Maggie. — It is the rubbing on the surface it rolls on which stops it.

Teacher. — That is *friction*. There is less friction the smoother the surfaces, but there is some friction however smooth the surfaces; and all the friction is not in those surfaces, but a part of it in the air. That is what stops a thing moving through the air. Even if it were not for gravitation, the friction of passing through the air would stop it. So you see friction stops a moving thing and holds it in its place with much power. If you rub things together very quickly, the friction makes heat and even fire. This was the way in which people used to make a blaze.

If a body moves very swiftly through the air, it will at last take fire.

Teddy. — Rockets will.

Teacher. — Rockets are set on fire before they begin to move ; but meteors or shooting-stars are great bodies of metal which are sent spinning through the earth's atmosphere by the great force of gravitation, and they move so far and so swiftly that they take fire by friction with the air, and burn and melt as they whizz by, until they fall to the earth, and cool to look like a great mass of iron-ore. We see them flashing along the sky some nights, and I have even heard them whizz. Friction has to be taken into account, in considering the effect of any application of force. It stops and it holds. It makes heat and flame and electricity. It is greater in proportion to the roughness of the substances it affects. I was in a train of cars once when they had to stop because the wheels had grown so hot.

Prescott. — They ought to have oiled them more, and then it would not have happened.

Teacher. — The oil would have made the surfaces smoother, so that the friction would have been much less. Do you know how very much

oil is used to make surfaces smooth and lessen friction?

Carrie. — Machinery has to be oiled very often, to go smoothly. I saw a man climbing all over the great engine in the steamer, with an oil-can.

Teacher. — Did you ever rub sealing-wax on woollen until it would attract other things toward it, such as hair or feathers?

Agnes. — I saw Louis doing it one day, and the sealing-wax was hot.

Teacher. — That is because the friction brought out heat and electricity. The heat and electricity must have been both in the wax; the friction brought it out. Some day we will say more about this; but now we are thinking about friction only as a means to stop and hold; sometimes of use, and sometimes an obstacle to be overcome. An obstacle is not worth minding if we can only bring force enough to overcome it. We can soon learn to turn it to good account. *Friction* we may set aside for the present, and go back to our machines. You may all cut an inclined plane from this paper, and wind it around your slate pencil from the wide edge. What does this line twining around the pencil remind you of?

Willie. — It looks like a screw.

Teacher. — Here is a real screw. Twist it into this hole in the wood. The inclined plane is turned all around in the hole, gradually working its way wholly within. If the winding edge of the plane is sharp, it cuts its way in like a revolving wedge, or it pushes the resisting wood up its spiral inclined plane, with a gradual force, easier to apply than the sudden blow upon a nail, which is only a straight wedge. Remember, then, the *inclined plane*, the *wedge*, and the *screw* are various forms of the same thing, and used in every variety of machine to assist man in the application of force to do his work. This *force* or *power* may be man's muscle or the muscular power of some animal, the steam of an engine, water, air, electricity, or any of the forces of the earth which man has learned to use. The machines help the natural forces to do more work and with greater ease than would be possible without them.

III.

Teacher. — Let us see what we know of the forces of water, and how they may be used. If

I put water in this cup, and now punch a hole in the bottom; what happens?

Holly. — The water runs out.

Teacher. — Now I will punch a hole in the side.

Prescott. — The water runs out there, too.

Teacher. — Now this teapot is full of water, but I am pouring in more?

Lottie. — It is running out of the spout and over the top.

Teacher. — And the spout is as high as the top, so the water is pushing up as high as the top. Which way does water push, then?

Lily. — It pushes every way.

Teacher. — If I put this book in the empty pitcher, does it change the shape of the book?

Madge. — No.

Teacher. — Here is some water in this cup. What shape is the water?

Teddy. — It is the shape of the cup.

Teacher. — Suppose it were in a square box what shape would it be?

Prescott. — Water will be the shape of what it is in, of course.

Teacher. — Now, if I put the water that is in the cup into the pitcher, will it change its shape?

All. — It will.

Teacher. — The water spreads itself every way, then, and changes its shape, and a solid thing does not.

Madge. — Why does it?

Teacher. — I cannot explain it more than to say that the particles of a solid thing hold together more strongly than they push apart, but the particles of water push apart as easily as they hold together. And how is it with air? Does that push apart more easily or hold more firmly together than water?

Teddy. — It pushes apart more easily.

Teacher. — Yes; it fills everything, no matter what its shape or how large. Its particles separate as far as they can from each other. Now, as to water, you all have faucets in your houses; where does the water that runs from them start?

Prescott. — I know; from the Reservoir; and it is pumped there from a pond further off. It runs through pipes in the streets and houses.

Teacher. — Have you ever known whether the Reservoir is built up high or dug down deep?

Lily. — My uncle planned it, and it is a high building.

Teacher. — It has to be high. I will show you with this bent glass tube. I dip this end in the water, and now look and tell me how high it comes up in the other side of the tube.

Holly. — Nearly as high as the top of the cup.

Teacher. — Water will run as high and no higher than it was where it started. Now, some of the houses in town are up on a hill, and high ; so in order that the water shall run into their pipes, it must start as high as they are, and the Reservoir was built as high as that.

Prescott. — At Teddy's they have a tank up in the attic ; I thought that was so that the water would run down the pipes.

Teacher. — That was put there before the water from the Acushnet Reservoir was brought in pipes, and it was arranged to be filled by the spout from the roof, I suppose. Do you use it now, Teddy ?

Teddy. — No ; only to sail boats in it, and wade in it. Prescott got up to his knees in it, the other day.

Teacher. — Yes, I remember it very well. He had to pull his boat along by a string, as he couldn't use the force of the water to push it. How do you get your boat along in the river ?

Madge. — We row it.

Teacher. — What force of the water do you use!

Holly. — The oar pushes against the water, and the water pushes back on the oar.

Teacher. — Which has to push the harder?

Lily. — The water.

Prescott. — No; the oar.

Madge. — Why, one has to push just as hard as the other.

Teacher. — Right. And that brings the boat up to the oar when the rower leans back. Now, all make believe row, and think how it is. See: you depend on the pushing or resisting force of the water against the oar and the force of the man's arm to oppose it. Once they had boats with three tiers of oars, — ships with a large number of rowers.

Holly. — I know it. That was like the Grecian ships, and the ships of Xerxes, the triremes.

Teacher. — How does the "Martha's Vineyard" go?

Lily. — It goes by steam.

Teacher. — The steam alone wouldn't make it go.

Prescott. — The side-wheels make it go.

Madge. — The steam turns the wheels.

Teacher. — Who has observed the wheels ?

Ethel. — They are like a good many oars moving, when the wheel turns round.

Teacher. — Yes, you must notice that when you go off in her, this summer. How is it with the propeller ? Who knows ? What does the steam do to make it go ?

Maggie. — It turns a screw of four great curved scullers, at the end of the boat, in the water, and the Nonquitt boat goes in the same way. My father showed me about it, as we came up to town, one day. How does a ship go ? What moves it, Mrs. Hopkins ?

Teacher. — You know what the sails are for. The water does not make it go, it only retards it ; the wind must push harder on its sails than the water against its hull, or it will stand still, unless it gets into a current of moving water, when it will move with the tide. There are hundreds of ways in which the pushing force of water is used ; wheels of factories are turned, and all sorts of contrivances and inventions are used to make the most of it, to get all the advantages possible from

it. But here is something else. This towel has one end only in the water; this sponge touches the wet table only on its under side; does all the rest of it remain dry?

Class. — Oh, no; the sponge is wet all over now, and the towel is growing wet.

Teacher. — The other morning I found the floor near my sink was quite wet, and then I discovered the towel thrown over with one end in the basin where there was some water, and the other end dripping over the edge of the sink. How was that?

Teddy. — The towel and the sponge suck up the water.

Teacher. — The water climbs by little threads, or through little holes or tubes; it creeps up the sides, and fills the pores of the sponge, the web of the cloth, the cells of the plants and trees, in which the sap rises and oozes through the thin membranes. It climbs up a chain, too, in the same way; sometimes very fast.

Madge. — I know it does in our chain-pump. I draw the chain up, and soon the water comes so fast that it comes out of the spout, and I hold my face over and drink.

Teacher. — Now, you can often get this climbing.

force of the water, its disposition to follow a fine thread or tube, its *capillary attraction* as it is called, to help do something important. Keep it in mind,—you may want to use it. If you were very thirsty, and saw a deep well but nothing to draw with, could you contrive some way to get a drink?

Lily. — I could. I'd tear my dress up and make a long string, and suck up some water out of it when one end was down in the well.

Teacher. — Before the next lesson, I want you to think of some other forces of water, and how they are used. Perhaps you can discover or invent something.

Holly. — Do you believe we can?

Teacher. — I have no doubt you can, if you watch and think. Most likely it will be something that has been discovered or invented by somebody else, but that is no matter. It is just as good for you to find it out yourself, as if no one else had done it.

IV.

Teacher. — If you wish to move your arm, Holly, how do you do it?

Holly — I make myself.

Maggie. — You told us in Physiology that the will is carried from the brain to the muscles by the nerves, which contract the muscles, so that the arm moves; it goes by a sort of telegraph, so quickly that we don't know any more than that when we want our arms to move, they move.

Teacher. — You have learned to control the force there is in your arm; you didn't know how, when you were a little baby, and had to learn by trying. I saw a child as large as you, Holly, that hadn't learned, because his mind was too foolish, and he couldn't manage his arms or legs at all; he lay on a cushion like a little baby, only because he had not the sense to learn to use the force of his own muscles. Can you control any other muscles besides your own, Prescott? If you have a load to draw which is too heavy for you to pull, what can you do?

Prescott. — I can get a horse to pull it.

Edith. — Or an ox.

Dolly. — Or my dog; he carries a basket, or draws my sled.

Teacher. — Of what advantage is it to make the

horse and the wheel do it? Could not a man use the saw and cut the wood with the force of his own muscle?

Dolly. — Yes; but the horse is stronger, and can do it a great deal faster with the wheel. I saw a horse going round and round in the street, the other day, and winding a rope about an axle so as to pull a house along.

Carrie. — I saw, down on the wharf, a horse going forward and back, to hoist a box of coal and lower the empty box.

Teacher. — Did you ever see a dog's muscle used to do work? Dolly uses her dog.

Gertrude. — When I was in New York with mamma, I used to see the dog-carts go round every morning to get rubbish.

Teacher. — Once people used to roast meat before the fire; they had to keep it turning all the time. It was tiresome for a boy or woman, so they trained dogs to be turnspits.

Maggie. — How funny! I have seen a bird trained to lift its food into the cage with a string, and a monkey to fire a gun.

Lily. — In the cold countries, the reindeer draws the sledge.

Sylvia. — In South America, the beautiful little llamas carry the loads down the mountains.

Holly. — In the hot countries, they use elephants to carry loads.

Prescott. — In the desert, camels.

Teacher. — Can man control all these animals, and make them do his work, without trouble?

Holly. — No'm ; they have to be trained.

Prescott. — They have hard work to train them, too, and they have to tame them first.

Teacher. — Do you think man will ever have under his control all animals, — the wild animals, — so that they will do his work?

Maggie. — Perhaps so. Do you think so?

Teacher. — I think it possible in the future ; for man is made as the head and king of all the forces of the earth, to control and subdue them. He has to learn to make the most of his own forces by training his body and mind, and then he can add to this power of his own the power of other animals which he tames and trains ; because God made man to have dominion over all creatures of the earth, to do his bidding.

V.

Teacher. — Prescott, see how the gutters run to-day; the snow is thawing fast. Do you think of any work you can make that swift stream do?

Prescott. — I see it push a good deal of slush along itself; it is doing its own work.

Ethel. — Oh, Mrs. Hopkins, don't you remember all that you read to us out of the *Fairy Land of Science*, about the water and ice and snow? They do wonderful things that men cannot do.

Teacher. — That is true, but they will at the same time stop and do a little job for us. If Holly should put a little wheel out there, would the gutter stream turn it for him?

Holly. — I guess it would. I should stick the wheel up in lumps of snow so that it would just dip into the gutter, and the stream would turn it quick enough.

Teacher. — Suppose it didn't turn as fast as you wanted it to?

Prescott. — We could make a dam and a waterfall, and then it would go rushing.

Teacher. — A great deal of work is done in this way, by using the force of running or falling

water to turn wheels. I have seen an immense wheel turned by water falling over a great dam, built in the Merrimac River, and this wheel by belts turned a great many wheels and spindles in a large cotton factory. Ethel, do you remember the windmills on the road to Nonquitt.

Ethel. — Oh, yes ; those great sails are turned by the wind and pump the water up to the top of the high frame, so that it will trickle down through all the branches laid upon the frames below and leave salt upon them. Mamma explained it to me one day.

Edith. — I can make a windmill myself.

Teacher. — So you can ; but you must try and see if you can make it do any work. You want to use the force of the wind. What a tremendous force it has ; and the force of the air as you push against it is very great to resist you. You must think how you can use its power to resist, as well as its power to move. Air and water hold great forces, which man must learn to control. He must first find out how they will act, and then how to use them. The force of the earth drawing all things to itself is another force we can use. Suppose two boys are throwing snowballs. One

boy stands on a level with the mark he aims at, but the other goes up on a high place and throws them down ; which is the wiser boy ?

Polly. — The boy who went up high, for it is easier to throw down.

Teacher. — Yes, that boy got the earth to help him. It is the force of gravitation. A man by the name of Isaac Newton first watched an apple falling from a tree and thought about it until he understood that the earth draws all things toward itself. This explained a great many things, and led to other discoveries. The earth has many forces. We have only begun to find them out. They are waiting like restive horses in their stalls for man to bring out and use. Perhaps you can discover some of them. All is done by observing and thinking, watching, trying and contriving.

The brain of man is given to him by God to use that he may be the master of the earth, that he may make the air, the earth and the water, and even the sun, moon and stars, work for him.

CHAPTER XI.

PRIMARY CLASS IN PHYSIOLOGY.

I.

AFTER an exercise in calisthenics, the six youngest pupils remain standing.

Teacher. — What nice twisting bodies you have, just like india-rubber ! Is that what you are made of ?

All (laughing). — No ; we're made of flesh.

Teacher. — How do you keep up straight, then ?

Prescott. — We have bones.

Teacher. — Any bones like this (showing a fish-spine) ?

Holly. — No ; I guess not.

Teacher. — When you undress to-night, feel up and down your back, and tell what you feel. You may feel of each other now, gently. Madge, what do you feel on Lily's back ?

Madge. — Knobs, all in a row.

Lily. — So do I, on Madge's back.

Holly. — It goes all up and down my back.

Teacher. — You may as well call it your backbone. It is something like this of a fish.

Prescott. — What makes the knobs?

Teacher. — Look at this. Is it one bone?

Lily. — No; it is a good many little ones.

Teacher. — You can count the knobs on your back to-night. You should find twenty-five. Each is a little bone with points sticking out around it, and a hole in the middle, through which a soft cord runs. So your backbone is really twenty-four small bones, like beads strung on a string, and each has hooks with which it holds on to the other, as they are all caught together. (Show a vertebra.) Now all bend over, and then back, very far and fast, back and forth, back and forth. Do you hear all those little bones rattle or crack as they move, and the cord strain?

All. — No, no; they don't make a bit of noise.

Teacher. — Isn't that funny? One would think they would all go creak, creak. If they did, what should you think would cure it?

Lottie. — I should think they would be oiled.

Prescott. — I should put something soft between them.

Teddy. — How is it fixed?

Teacher. — Why, God thought just as you do, and he put little soft cushions between them, and little bags of oil to squeeze against them, so that they do not rub and grate on each other.

Girls. — How good! (Boys look serious.)

Teacher. — What keeps you so firm and round, Prescott? See, when I clasp my hands on your sides and about your chest, I can't squeeze it in like a rubber doll.

Holly. — But you can down here.

Madge. — There are bones up here, and not down below.

Teacher. — Now feel of yourselves, all under your arms down to your waist. Do you feel the bones?

Lily. — I feel bars going in a ring just like hoops.

Holly. — So do I.

Teacher. — Now feel in front. Do you feel the bars there?

All. — No; it is flat and hard.

Teacher. — One flat bone in front, and hoops on each side. I brought these old bones to show you; they are the bones around a horse's chest, a good

deal like yours. I found them out in that old field by Cedar Street. They were joined to a backbone, also, at these ends. These bars are a part of the little bones of the backbone, reaching around the chest to this flat bone, — the breastbone. So your chest is all framed in, isn't it, Lily? Here is a picture of it. Some of these bones are a little soft near the breastbone: and in you the breastbone is not very hard, but it will grow harder. These bones that hoop around are called *ribs*. The other day Mr. Bliss fell from the roof of a house, and broke two of these ribs. He has to be very still while they mend themselves, and it will hurt him a good deal. If more of them had broken it might have killed him, for the parts of the body within the chest cannot bear to be hurt without killing us.

Madge. — Jennie broke a bone in her leg, the other day, and the doctor tied her leg up in pieces of wood, and she has got to lie in bed three weeks.

Teacher. — Feel of your heads. Squeeze them. Are they hard?

All. — Yes, very hard; it is all bone.

Teacher. — The bone of your head is called the skull. It is pieced together in little jagged seams

in these places, — here, and here, and here. It is a very good way to join bones together so that they won't come apart, and so that if you hit one part it won't jar the other parts as much. The cushions in your backbone save a great deal of jar, too. Just think how it would hurt you to knock the end of your backbone, if that and the skull were one solid bone. I guess it would make your head ache.

II.

Teacher. — You all examined your bodies last night, you say, to find out what bones make its frame-work. Tell me, Prescott, what you found out about your chest. See, when I feel of Prescott about here [the chest], he isn't soft, like a rag-baby, and I cannot punch him like a rubber doll. All feel of your chests.

Prescott. — There is a bone in front, and some hoops around here under my arms.

Teacher. — Just like this [illustration by drawing a model]; these hoops join the bone in front, the breastbone, and the backbone behind. See, are they separate from the backbone?

Lily.—No, they are parts of the little spine-bones.

Teacher.—They are the arms of the small bones stretched out to embrace you, and give you a place for your breath to come and go, and for your heart to beat. They are joined to the breastbone by little pieces of gristle, like white india-rubber. You have seen it in meat. Here are some below, which are more loosely hung, so that they can spread when the breath is very full. This breastbone may be partly gristle in some of you; it will grow into firm bone by and by. The breastbone, the spine, and the ribs make a nice room for some very important parts of your body. Take a good long breath, with your hands each side of your breastbone. Do you feel the ribs push out?

Madge.—Yes'm, and I feel something push down and swell out in front. Is that a bone?

Teacher.—All breathe slowly, a strong, full breath. Do you feel it as Madge says? Well, there is a strong wall there below to this room, full of the machinery which keeps us alive. That wall is not a bone; it is called a muscle. It is a strong, elastic thing, which will stretch down and out as you need to have it. There is something

else in this nicely protected room besides the breath ; feel on the left side among the ribs ; what do you feel ?

Teddy. — I feel a hammer. I guess they're building the wall.

Teacher. — Can you stop the hammer ?

All. — We cannot ; it goes right along.

Teacher. — It is your heart beating ; it will never stop until you die. It goes like this [imitating the contractions with the hand], and drives the blood all through your veins ; it keeps you alive, and makes you grow ; it is like a hammer, building the walls ; or like a clock, measuring off the seconds of your life ; or like a drum, beating to call you to do what you have to do. It makes your pulse beat ; put your finger here on your wrist, and feel the little hammer there.

Lottie. — That's where the doctor feels my pulse.

Teacher. — To see how your heart is beating, or how regularly and truly all the machinery is going. There is something else in the chest, too, to be taken good care of within the framework of bones about it. It is your stomach, which takes in all you eat, and changes it so that it can be made into

blood. The breath goes in and out of the wind-pipe and the lungs ; the blood goes through the heart, and the food into the stomach : and all these are within the chest, surrounded and protected by spine, breastbone, and ribs. Now, stand very erect, and breathe as I move my hand, very strongly, and feel your ribs. Shall I tell you the names by which these little bones and the breastbone, also the muscle below the chest, are called? The whole backbone, made of twenty-four of these little knobby bones which link together, is the spine ; each little bone of the spine is a vertebra ; the breastbone is the sternum ; the muscle is the diaphragm. To-morrow we will see about the bones of the arms and legs, hands and feet ; and about the joints, or how the bones move upon each other.

Ethel. — The bones you show us are very dry and rough. Is that like our bones?

Teacher. — No ; they are old and dried in the sun and weather ; all the oil is dried out of them, and they are brittle. Your bones are softer and smoother, and more elastic ; they will grow harder and more dry and brittle when you are old. What are they at all like ?

Teddy. — Something like chalk.

Teacher. — Yes, and they *are* like chalk; they are made of lime very largely. Have you any opportunity to look at your own bones, to see whether they are like this?

Ethel. — I hope not: not unless we cut our flesh.

Teacher. — Prescott came in from recess yesterday, with one of his bones in his hand.

Prescott. — Oh, my old tooth! I threw it away.

Madge. — Are our teeth bones?

Teacher. — Well, what do you think?

All. — Oh, yes, they are.

Lily. — But they are very smooth.

Teacher. — They are dressed up a little to show, with a nice, hard polish on the outside, called the *enamel*, which protects the bone.

III.

Teacher. — As you go through your calisthenics I cannot help thinking how easily and rapidly you can bend your arms, your wrists, your fingers, your knees and ankles. How is that, Madge? will your bones bend anywhere?

Madge. — No, no ; my arms will bend only at the elbows.

Teacher. — How do you whirl your arm around like a wheel, in this movement, then ?

Madge. — Oh, it moves at the shoulder, too.

Holly. — And at the wrist and fingers, in two or three places.

Teacher. — These places are the joints. Now, all try your shoulder-joints ; can you move them up or down, or backward and forward ?

Prescott. — I can move them up and down, back and forth, and round and round.

Teacher. — The joint is like a ball in a cup, in which it can turn almost every way. The end of the arm bone is a ball of bone covered with the smooth, elastic skin called cartilage, as all the joints are, and the shoulder is fitted together to form a cup, in which the ball is held by firm elastic cords so that it will not slip out, but can turn in any direction. How convenient it is to swing the arm when you throw, and how important this free movement for the use of the whole arm !

Holly. — What are these bones at the shoulder ?

Teacher. — There is a large three-sided bone from the back, called the shoulder-blade. You can

see it plainly as you push back the arm at the shoulder. There is a bone plainly seen also on the front of the neck, called the collar-bone. These two bones join at the shoulder, and their united edges form the cup. The collar-bone is fastened to the breastbone, and the shoulder-blade to the backbone. Can you all feel these bones plainly?

All. — Yes, very plainly.

Teddy. — Stan broke his collar-bone one day, and it mended with a crack in it.

Teacher. — It ought to have mended better than that. Wasn't it well fitted together?

Maggie. — Well, Mrs. H., he tried to kick football before it was quite well, and he fell down and broke it again.

Teacher. — He ought to have kept still until it was firmly knit together. But it isn't a very severe thing to break the collar-bone; not at all like breaking one of the large bones. You see how small it is. Now all see how many ways you can move the elbow.

Lottie. — Only up and down.

Teacher. — What kind of a joint will move only one way? Try the door. What is that which makes it swing back and forth?

Prescott. — It is a hinge. Is that the way our elbows are made?

Teacher. — Yes; very much. The elbow and fingers have hinge-joints. Make them all go. You know we have to oil hinges occasionally, so our joints are constantly oiled from little bags near them, which squeeze out oil when the joint works. What other joint in your body is a hinge-joint?

Carrie. — My knee, I think.

Teacher. — Does your knee feel like your elbow?

Madge. — No; my knee is flat and my elbow pointed.

Teacher. — The joint of the knee is covered by a little flat bone to protect it; the bone is the knee-pan. You can make it knock against the point by striking it, and it sounds like money. Try it.

Prescott. — I can make you think I have money in my hand.

Teacher. — So the knee is a hinge-joint. How many ways do you find it to work?

Teddy. — It goes up and down.

Teacher. — Now try your toes. Can you move them like fingers?

Ethel. — Only a little; but when my foot is bare I can do it pretty well.

Carrie. — Baby moves hers all round and sticks them all apart.

Teacher. — I heard of a man who could sew and knit with his toes, and of one who could play on the piano with his.

Madge. — Why could he?

Teacher. — He had practised it a good deal, because he had no arms. If we practised moving our toes we could do much more with them than we think. Any joint or other part of the body will work more freely by exercising it. Whatever we try to make the body do, it will come to do in time; it will obey our will if we train it. Now try your wrists and ankles. Move them every way you can.

Agnes. — Why, they will go any way you try.

Teacher. — They are quite different from the other joints. Take off your round gold beads, Gertrude, and they will roll on each other any way: I put them in two rows and see how they may turn about. The wrist and ankle have two rows of little bones, four in a row, upon which the hand turns; the movement is easier and more

varied than the ball and cup joints. When Louie plays on the piano see how many ways and how quickly she can throw, turn, or twist the hand. It is the smooth rows of little bones that do it. It is much worse to break the wrist or ankle than the collar-bone, and takes a long time to heal the break and make the joint strong again.

Maggie. — Yes ; it is a year since mamma broke her ankle, and it isn't strong yet.

Teacher. — Be very careful of the ankle and wrist — and of the knee, too. When these joints are hurt, some trouble is apt to occur, because they are harder to reach than some of the other joints. The socket at the hip is formed by the meeting of two strong large bones which support the body. Your backbone is like many hinge-joints ; your shoulders and hips are ball and socket joints ; your elbows and knees, as well as the joints of your fingers and toes, are hinge-joints, and your wrists and ankles are rolling joints. Now can you all repeat this ?

All repeat it correctly, and then all the class are allowed to try moving as many of their joints at once and as rapidly as they can, which ends the lesson.

IV.

THE class should be allowed to see a manikin during the study of the bones, and be led to observe all the bones and joints carefully.

Teacher. — We have learned what the framework of the body is, and how its different parts are joined together for our convenience. Do you think it like any other skeleton?

Teddy. — It is made something like a monkey's.

Prescott. — It is like animals, a good deal.

Teacher. — So it is, but it stands upright, and has two arms instead of two fore-legs. Nevertheless, it is on the same plan as that of all four-footed animals; you can easily see the likeness and the difference. The long chain of bones in the back, the spine, is the same, and gives a name to all animals that have it; they, with man, are called the *vertebrates*, from the name of each little bone of the spine, *vertebra*. (Let the class name a variety of vertebrates.) Is this framework of bones inside or outside of us?

All. — Inside.

Teacher. — Are you not glad that it is clothed,

and made beautiful with flesh and skin? What is the flesh?

Madge. — It is the part that has blood in it.

Prescott. — It is the part we eat in animals, — the meat.

Teddy. — It is the thick part around the bones.

Teacher. — You are *all* right. At recess I will take you over to the meat-market, and show you how it is wound about the bones and lies close to them, with a thin skin around it which twists into strong cords at the ends, and fastens the flesh tightly at the joints. What are the cords and the flesh for, do you think?

Lottie. — To cover the bones.

Teacher. — Did you ever take a chicken-leg from the kitchen, and pull the end of a tough white cord, showing just where the joint was cut?

Ethel. — I have, and it pulled up the claws, and acted just like walking.

Teacher. — The cords at the ends of the muscles do the same thing; they move all your joints, pull the bones this way or that, as you wish. The muscle, — that is, the flesh which is wrapped about the bones, — is shortened, and brings up the cords to pull the bones; I cannot fully understand it,

but when you wish your arm to come this way, your muscle knows it, and shortens to pull up the arm; it is as if your mind up here in the brain sent a telegraphic despatch to the muscle to pull up the arm, and it did so. God understands it, who made it. There are little fine threads going from the spinal cord which joins the brain, and these threads are like the telegraphic wires; they carry the message of the thought and will, and are called nerves.

Agnes. — I never heard of anything so nice as that!

Teacher. — You didn't know you had a thousand telegraphic wires in you; but these little nerves go to every spot in your body; if you prick any part with the finest needle, the message goes by the little fine nerve that reaches that spot, all the way to the spinal cord and to the brain, to tell your thought where it is, and you can tell at once, without having seen, where it is. Suppose it were not so, how often we might be hurt without knowing how or where, and perhaps we might even be killed without a chance to prevent the fatal effect of some little wound.

Willie. — I felt something hurting my hand, the

other day, and looked, and found a piece of a needle almost hid in the flesh by my thumb, and my father got some pincers and pulled it out.

Teacher. — These little nerves tell the *muscle* what to do, and then the muscle shortens or lengthens and does it. All draw your arm up and forward from the elbow ; shut your hand tight, and feel of the muscle. Can you feel it ?

Madge. — Papa laughs at my muscle ; his is just as hard as iron when he does this, and bunches right out.

Prescott. — I can show my muscle ; it is hard, too.

Teacher. — See how firm your muscle is on the lower part of the leg, the calf of your leg. That is large and strong, because you use it so much, jumping, running, skating, and walking. The muscles grow round and firm by using. They are all over you. Did you see the men at the circus, who leaped so well and performed on horse-back ? Their muscles were all well developed, and looked as they ought to look, and made the whole body very handsome and graceful, and agile and strong. You must exercise all the muscles, to make your body grow as it was meant to grow.

There are great bands of flesh or muscle across the chest, and they ought to be strong and make the chest round, the body erect, and bring the shoulders back. Stand up as you think you ought to look. Now take a good, long breath. If your chest-muscles are strong, you can breathe better ; and you remember I told you about a strong muscle which separates the chest from the lower part of the body ; that is the diaphragm, — and when you breathe it swells out and draws in, and moves up and down. Do you feel it ?

All. — I feel it.

Teacher. — When you use the muscles, the blood rushes quicker into the little veins, the blood-vessels, which are just like a fine net-work all over the body and through all the muscles. The blood keeps the muscles warm and alive, for it carries something to them to build them all the time, as they waste from using, and it carries back the wasted parts, which would decay and corrupt the body otherwise, and that is just what happens when a creature dies — the flesh decays ; you all know this. We will go and see the flesh at recess, and I will show you how it lies about the bones and is tied to the joints, and you can think

that it is very much the same as your flesh, which is so much of your body and does so much of your work.

V.

Teacher. — Madge, we went over the rope-works, yesterday, to see the machinery. What room did you think contained the most important part of it all?

Madge. — The room where the engine was, for that keeps it all going.

Teacher. — True; and if the engine is taken good care of, and kept going just right, every wheel will do its work and all will go on as it should; but if the engineer neglects his duty, or has not the skill to manage the engine, some bad accident or disorder might result. How nice the engine was! and the room was quite clean, and the men there were busy and attending to their work. Now, all put your hands on your heads. Your head is your engine-room; in it is the engine — the brain. How solid the walls of the room are! Where are the doors, and windows, and the belts which go to turn all the wheels, and keep your whole body-factory at work?

Esther. — The eyes are the windows.

Prescott. — So are the ears.

Teacher. — Through the eye and the ear come to the brain the light and sound of what is outside the body; through the nostrils and tongue, the smell and taste; through the skin, the feeling. All these are called the "senses." (Enlarge upon these *ad libitum*.) But how does the brain communicate with the rest of the body? How does it get news of any hurt or any good to the rest of its body, or send any message to other parts of the body, such as a message to the arm to move, or to the feet to walk?

Lottie. — You told us there were a thousand telegraphs to carry messages back and forth all over the body.

Teacher. — Yes, these are the nerves. The brain and the spinal cord, and the nerves are all one, like a root and stem and branches. All together they make up the nervous system. I went into a Surgical Museum once, and in a glass case I saw an exact representation of the nervous system of a man by itself, separated from all other parts of the body, as if it had been drawn out and hung on a hook by the brain; down from the base

of the brain behind hung the spinal cord, and from it hung the principal nerves of the arms and legs, with all the hundreds of little thread-nerves running from every part of it. It was a curious looking thing.

Teddy. — What color was it?

Teacher. — If you could look inside your skull, your engine-room, you would find it packed quite close with soft gray coils and bunches. This gray mass is the brain; it pushes its substance down through all those little holes in the spine, — the middle of the vertebræ, you remember, — and sends out threads all over the body from between these little bones. The brain is the tool of the mind.

Ethel. — I thought the brain *is* the mind.

Teacher. — When your body dies, the brain will die, too. You could see a dead brain, of no more use; but the mind is still alive, and I am sure must have a better tool or machine than the brain, although that is better and nicer than any made by man. Does this machine or engine ever get out of order?

Maggie. — When a man is crazy, is it out of order?

Teacher. — Yes, and do you not think that is almost the worst thing that could happen to us, that our mind should be out of order, as we say, when the mind cannot control the brain?

Mabel. — Oh; yes; for then we might kill ourselves or somebody else.

Teacher. — Sometimes the brain is hurt, or sick, and that is often fatal,—always very hard to cure. If a man falls and cracks his skull and knocks a piece of it against the brain, or wounds or inflames the brain; or if he uses or excites the brain too much, so that it becomes too tired, it is a very serious matter, and very hard to cure; but if it is the connection between the mind and the brain that is affected, then it is called insanity, and the man is like a workman in a factory whose engine is all out of order, and nothing can be relied upon; his machinery may kill him, and everything may go contrary to the rule. Should you be careful of this engine?

Prescott. — Very; but how?

Teacher. — Do what keeps the whole body healthful; the brain is a part of the body; also let the brain rest when it is tired. Let it work well and regularly when it works, and go to sleep when

it is tired. When it is too tired to work, sleep comes like a night-watchman and shuts up the doors and windows, and the engine stands still. The mind lets it alone and it gets rested. You saw the rope-works' engine resting, and a man was oiling it and polishing it and getting it all in good order for work. That is what sleep does for the brain.

Gertrude. — How does the brain work?

Teacher. — I don't know that I can tell you. There is, probably, some movement of a particular part of it for every kind of work. Now, try to remember something. A certain part of the brain moves now, and you remember. Now try to understand something hard; another part of your brain works, and you understand. The action of any part of the brain strengthens that part, just as I explained that the exercise of a muscle strengthens that muscle. Make your mind do what is hard for it to do, and it will do that easier the next time; so you improve different parts of the brain and cause it to grow. You can even change the shape of your head by a habit of exercise for some part of the brain not well developed or strong. If you haven't much decision, form a

LESSON 10. THE MIND AND THE BRAIN

What are the organs of the mind? What are the organs of the body? How are they connected? How does the mind control the body? How does the body control the mind?

Teacher — Can any of you tell me I make my hand forget?

Teacher — I do not promise that, but people do it very much about it. Say that the mind uses different parts of the brain for different kinds of work and shapes the brain and skull so as to show what parts are most developed, and what kinds of work the brain can do best, and I am sure as exercise trains the muscles, so it does the brain. Your mind will become weak if you do not use it, just as your muscles would. The will is the controlling force of the body, and the mind is the power that uses the will. The mind ought to govern and use the brain perfectly, and that is what I am trying to train your minds to do. The mind can control not only the brain, but the whole body, much more than you think, and keep it well and make it work well.

NOTE TO TEACHERS. — This subject can be developed much more fully, even to youngest pupils, and interests them very much. The organs of sense each form a lesson or more, and the distinction between the mind and the brain can be further dwelt

upon, as they all understand how the brain may have an impression of sight or hearing, while the mind is too much occupied to attend to it; as a child absorbed in reading does not hear what is said, although the ear must still carry the sound to the brain. They will then know that the mind is quite distinct from the brain, and the soul can live without this body.

VI.

THE SENSES.

Teacher. — I told you about the brain, which I called the engine. Everything in the body has to be connected in some way with the brain; all knowledge of the outside world, all means of reaching outside things, of doing or learning, must come in different ways to it. What ways do you think of, Sallie, by which you can learn about this flower?

Sallie. — I can see it.

Teddy. — I can smell it.

Teacher. — How do you learn of the cricket, which we do not see, but which you know is near?

Prescott. — I hear it chirp.

Teacher. — And if I tell you to shut your eyes and open your mouth, and put *this* into it, what is it?

Amy. — It is a grape. I taste it.

Teacher. — Once a little girl had the scarlet fever, and it destroyed her sight, hearing, smell, and taste, and it seemed as if she could never have any way of knowing or doing or enjoying anything. Her body seemed like a close-shut prison for her mind. But there was one way left open, and a good, wise man took that way, and through it taught her as much as many a person learns through every sense of a perfect body. She is highly educated now, and has lived a happy and useful life. What was that one way left to her to find out about outside things?

Teddy. — She could feel of things.

Teacher. — Now name all these ways from the brain to the outside world.

All. — To see, to hear, to smell, to taste, to touch.

Teacher. — These activities are called the *senses*, from a word meaning *to feel*, because every act of the senses is a touch of the organ of sense upon what is brought to it. The eye is touched by waves of light, the ear by waves of sound, the nostril by perfume, the tongue by flavor, the skin by what is in contact with it. All these

parts *feel*, and the brain takes knowledge of what is felt. Name the *organs of sense*.

All. — The eye, the ear, the nose, the tongue, the skin.

Teacher. — The fingers have a very delicate and wise sense of touch, although the whole surface of the body can observe in the same way. In using these senses we ought to take pleasure, as it is intended that every healthy action of the body should give more or less pleasure; but we must never take more enjoyment in the mere action of the senses than in the purpose for which they act. You should not eat for the mere pleasure of taste when you do not need food. You should never use an organ of sense until it is weary, or until you cannot at once stop using it when it has done your work. You must control your senses; be their master, and not their slave. It is a sad thing when even a child cannot control his senses. He cannot be trusted to take care of himself. A man who is the slave of his senses is a brute, bad and degraded in character. The senses must always obey the reason and conscience.

Ethel. — Where is your conscience?

Teacher. — That is a part of the soul. We

cannot place it. It tells us what we ought to do or ought not to do. If we obey it, it will be faithful, and grow more and more clear and decided; if not, it becomes uncertain. It is the *sense of the soul*, as reason is the sense of the mind. The senses of all grow more delicate as we use them and do not abuse them. We must take good care of the organs of sense. The eye, for example, is so delicate and easily hurt: what protection has it?

Esther. — The eyebrows hang over it, just like a porch.

Gertrude. — I have often thought the eyelids are like fringed curtains to cover it. They open and close so quickly, before you can think of it.

Teacher. — You have a little fountain of salt water to wash it with. We will take the *eye* for another lesson.

VII.

THE EYE.

Teacher. — Each of you look at your neighbor's eye steadily. Is the eye flat or rounded? It is rounded. Yes, it is a ball. You may have seen

a fish's eye: it is smooth, hard, and slippery. Do you see a little mirror in the middle, with your own face reflected in it? You do. That mirror is a little, convex, transparent surface, like glass, over the open end of a tube that leads into a dark chamber, where any impression of your face is spread upon the walls as it is upon the photographer's plate, and that picture is carried by a nerve to the brain, which perceives it and sees your face. So it is with all that is before the eye. That black hole is called the *pupil*, the glass-like surface over it the *cornea*. Do you see the blue, or gray, or brown circle outside the pupil? That is the *iris*. It shows little muscles to draw the edges closer together and make the pupil larger when it grows darker so as to give room for more light to go into that dark chamber and make the picture clearer on the walls. What else do you see, Alice?

Sallie. — I see the pupil grow smaller and the blue part grow wider.

Teacher. — There are some other circular muscles which draw the iris up over the pupil like strings in a bag, when the light is too strong. Roll your eyes around. Can you?

All. — Oh, yes! every way.

Teacher. — There are muscles and cords holding the round eyeball in its socket, which can act like the cords and muscles in any part of the body and turn the eye as we will. Did you ever see a person cross-eyed, or with eyes turned too much toward the nose? Something was wrong with some of the muscles, in that case. If you use your eyes too much, you may hurt these muscles; if you hold your book too near, you will hurt the eyeball, making it grow convex. If you keep glancing too rapidly from a distant to a near object, you will tire and weaken one of these muscles and grow more and more near-sighted. Always heed the caution of those who have had experience in troubles of the eyes, for it is such a terrible thing to have the eyes hurt or impaired by abuse. Hold your head up naturally as you sit erect, and read with the book at just that distance where you read easily. Do not read or look with one eye only, but with two, as is designed for you. Bathe the eyes with fresh, cold water; open them in water every day; rest them when they feel tired. If you are at all near-sighted, practise looking at distant objects. Do

you see the little blood-vessels roll over the eyeball?

All. — We do.

Teacher. — Don't touch the eyeball. See how hard the eyelid tries to prevent you. It is not meant to be touched. Never try to read or work by too dim a light, nor to look directly at a very bright light. Why do you have two eyes?

Prescott. — To see all round a thing.

Teacher. — If you look with one eye, a thing looks more flat; with two eyes we see it from two different points at once. Look at this stereograph, — two pictures of one thing, — are they exactly alike?

Lottie. — This one has more of the house on this side of the picture.

Teacher. — Do you all see that there is a very little more of one side in one picture, and of the other side in the other picture? That is the difference between the thing we see with our two eyes. Try experiments, first with one eye and then with the other. You find you do see things a little more or less on one side, with either eye. So we get a truer view of the whole thing with both eyes at once. The nerve which

carries the picture to the brain is the *optic nerve* ; it has a branch to each eye. There are two little transparent lenses for the rays of light to pass through before the impression reaches the optic nerve. You must learn more about light, and how it waves, before you can understand fully how the image which passes into the pupil through the convex lens over it, the cornea, reaches this nerve.

VIII.

THE SENSE OF HEARING.

Teacher. — The ear is a strange-looking part of the head, somewhat like a little trumpet attached to the side of the head.

Carrie. — It looks like a shell.

Teddy. — Does the opening go way into the head?

Teacher. — No ; you would find something very soon which would stop the way ; it would look like a little round white membrane, as it is, like the parchment of a drum stretched over the opening ; it is delicate and thin, about so wide ; it

quivers or vibrates when sound strikes it, just like any stretched surface; it vibrates with the sound-waves of air, and that vibration is carried through it to four little bones which are in an open chamber behind it; they carry it on through a spiral passage very much like the windings of a snail-shell, until it reaches the nerves, which carry it to the brain; when the brain receives the impression, or knows of the vibration, *sound* is the result. Why do you think the external ear is shaped so curiously?

Ethel. — To get all the sound it can.

Teacher. — The vibrations of the air, which are waves of sound, are gathered up in the expanse of the outward ear and transmitted gradually through quite a tube without sudden shock to the delicate drum of the ear. This drum is so delicate as to repeat the vibrations very truly to the queer little bones which touch each other behind it, and the vibrations are carefully carried on, winding gently to the connections with the nerve which perceives it for the brain. Very nice care has been taken that we may hear. If you should see the whole machinery of the ear, you would wonder at the wise contrivance.

Fanny. — Why cannot Alice hear as well as we? Her ear is just as good.

Teacher. — Alice had scarlet fever once, which destroyed the drum of the ear, as it often does, breaking it down by some very poisonous matter which was near it and which had no other way of escaping from her blood. It pierced this delicate little drum, and wore it away entirely in one ear, and nearly all in the other; yet the little bones are left, and the vibrations of the air reach them through the bones of the face and head where it touches them. Alice can hear a little when she opens her mouth.

Alice. — I know I can; or if the piano is playing, I can hear better leaning upon it. Why?

Teacher. — The vibrations are carried through the mouth and by the teeth or by the arm to the bones of the face, or through tubes leading from the throat into the chamber of the ear where the four little bones are. The outer ear is a protection to all the nicer and interior parts of the organ of hearing. A waxy substance surrounds the tube of the outer ear to keep out anything which might otherwise touch the drum. We should never put anything hard or sharp beyond this, for fear of

piercing the drum. Some sound-waves are so strong that they are perceived also by other parts of the body, as for instance the firing of a cannon or heavy thunder, making the whole air shake; but the ear is especially arranged, — made exactly so as to gather and carry the delicate vibrations of usual sound, which we could not otherwise know. Now let us attend to the sense of smell. What is its organ?

Answer. — The nose.

Teacher. — There is something which we call perfume; it would be hard to say what it is; sometimes it is agreeable to us, and sometimes not. We cannot tell why, but it is very decided.

Hattie. — How queer it is! I am trying to think what perfume can be, but I am not able to explain it.

Teacher. — Now suppose a little flower, tuberose or heliotrope, is here. Why, it sends its perfume into every spot of the air in the room instantly. You perceive it at once and everywhere, and will as long as the flower lasts in the room. If I took the flower out of the room, should I take the perfume out too?

Maggie. — No, you would leave what was already in the room still there.

Teacher. — Would it give less perfume in another room, then.

Daisy. — No'm; just as much until it is withered.

Teacher. — Isn't it very strange? Something escapes from the flower as long as it lasts; without taking time to travel, without making the space of the room any less, it fills every part of it, telling us of the character of the flower. One little drop of attar of roses will send its odor through a bottle as tightly sealed as we can seal it, and pervade everything it reaches with such a strong scent that it seems almost impossible to destroy it. What a wonderful quality! It reaches our brain through little nerves spread out upon the inside of the nostril, and we have the sense of smell. The sense of taste is almost as curious, but as it requires contact of the organ of taste, the tongue, with the substance which is tasted, it does not seem quite so impossible to understand. Look at each other's tongues. Look through this magnifying glass. How wonderful! A little forest! The surface of the

tongue is covered with little feelers which almost seem alive, and the flavor of what we taste comes to these so as to be conducted by the nerves which run from its surface to the brain. Thus we taste. The senses of taste and smell may both be injured or deadened by illness, or by abuse. They are intended to guide us in our choice of food and other things used by the body. They will guide us if they are in a healthy state, but we must not excite them too much, or train them to wrong uses. Can other animals use any of these senses better than we?

Willie. — Dogs can smell better. They can follow a man by his scent.

Prescott. — Setters can scent game, and show the hunters where to look.

Teacher. — Animals may have some senses we do not understand. These of which we speak are the human senses. Feeling is the perception by contact with any part of the body, for the nerves of touch come to the surface everywhere, but chiefly in the fingers, which can be made very keenly sensitive by practice, as in the case of the blind.

IX.

VITAL ORGANS.—THE HEART.

Teacher. — I have told you somewhat of all parts of the body except those which are kept in the two chambers within its outer frame. Put your hands upon your left sides, gently pressing. What do you feel?

Teddy. — I feel the little hammer that pounds all the time.

Teacher. — Do you have to keep that hammer sounding or beating by your own thought or will?

Blanche. — No ; it goes itself.

Teacher. — Here is the heart of a calf. Let me show you how it is made ; for yours, which is what you feel beating, is much like it. It has these two sides, one which fresh, red blood goes through, and one which the impure, dark blood, returning from its course through the body, fills. The heart is like a pump ; it forces good blood, which has been purified, through numberless tubes, called *arteries*, to all parts of the body, to build it and feed it ; then it receives that blood which has become impure, back through as many

tubes, called *veins*, and sends it into another organ to meet the air, which changes it to pure blood again, after which the heart again receives the blood and forces it once more through the arteries; and so this goes on as long as we live, the heart forcing the blood through arteries and veins by this action we call "beating," like the motion of a hand squeezing and opening with great force and regularity. There are little doors in the heart which open and close as the blood rushes through, and assist in keeping its direction the same. There are little doors, called *valves*, in the calf's heart. They are so nicely arranged that the blood cannot go the wrong way. They open and shut, open and shut, with every squeeze of the heart. You would wonder to see the force with which the heart sends this current of blood through the body. The blood flies swiftly around, leaving fresh life and substance for every muscle and nerve, and taking away the waste particles that need to escape into the air. If you should cut an artery, the blood would spout out like a fountain, and if it were not checked very soon you might bleed to death. This heart is necessary to life. It is

placed in great safety within the chest. It has strong muscles to contract and dilate with unceasing regularity and great forcing power. If it is injured, death will result. The flowing of the blood through the heart, arteries, and veins is called its *circulation*.

THE LUNGS.

Teacher. — The organ into which the blood comes to meet the air and be purified by throwing off its waste particles, is a double organ, called the lungs. It is within the chest, like the heart ; it is the organ of breathing. Do you have to breathe ?

Daisy. — I can wait a moment without breathing, but then I have to breathe again.

Teacher. — The action of the lungs, as well as the heart, is involuntary. You do not need to think of it or will it. It goes on regularly as long as we live. It is necessary to life, and the lungs are therefore a vital organ. I must also show you the lungs of the calf, and you will understand, better than I can describe it, how your own lungs look and act. Here are the two,

like red sponges, attached to tubes which are branches to this larger tube called the *windpipe*, since through it the air comes and goes into the mouth and nostrils. These two lungs will swell when the air fills all these little holes or cells. Now take a good, full breath. Do you feel the lungs swell within the chest as a sponge swells in the water?

Dolly. — I do; and they push down and forward and make me grow large.

Courtenaye. — I feel the cool air coming into my mouth and nostrils when I do it.

Teacher. — The blood comes into a thousand little veins which line these air-cells of the lungs, and all that is bad in it escapes into the air in the cells, and it receives the life-giving part of the air, which makes it fresh and pure to go back again through the heart to the body. When the blood, thus cleansed, leaves the lungs, the air which has cleansed it returns through the tubes and windpipe, through the nostrils and mouth, to the outside air; this breathing in and breathing out is repeated with every movement of the heart and lungs as long as we live. Thus the blood is kept pure, and the body renewed and alive. But you

can see at once that the air about us is hurt by the escape of this waste from the lungs; we must have fresh, pure air about us all the time, or the blood will not be purified enough by breathing. Some air is more life-giving than other. You feel brighter and stronger in it. Out-of-door air is the best. If you wish to keep well and be strong, you must breath fresh, clear air. It will make the blood red and give you rosy cheeks. You must hold yourself erect and wear nothing tight, so that the lungs and heart can act freely and work well. But do not run when you breathe too fast or when your heart beats too hard. Never overwork the heart and lungs by too violent or too long continued exercise, like jumping rope too long, or running when you are out of breath.

THE DIGESTIVE ORGANS.

Teacher. — There is one more organ which is necessary to life, within this upper cavity of the chest, protected by the spine, ribs, and breast-bone, and by that strong muscle below them called the *diaphragm*. It is the *stomach*. Here is the stomach of a pig; very much like yours. It

is a kind of bag. This tube which comes into it from above is the *gullet* and opens from the back of the mouth. The stomach is the place where the food is made fit to be changed into blood. You can tell me a good deal about the food you eat, as it is made ready to enter the stomach. Grace, if you are hungry, that is when your stomach calls for food, what do you do with the food you have put before you?

Grace. — I put it into my mouth; then I chew it.

Teacher. — When you chew it, what wets it?

Grace. — Some water comes in my mouth.

Teacher. — There are three little sacs opening into the mouth, under the tongue and within each cheek, that squeeze a juice called *saliva* into the food to make it soft. As you think of it, the juice starts from these sacs called *glands*, and you say your "mouth waters."

Prescott. — My mouth waters for an orange.

Teacher. — Elsie, what cuts up the food in your mouth?

Elsie. — My sharp teeth chop it all up fine.

Teacher. — How do you stir it about for your teeth to chew?

Edith. — My tongue rolls it around.

Teacher. — After it is all fine and moist you swallow it. A little trap-door opens to let it go into the gullet, and it is pushed along through the gullet by these little ridges partly opening and shutting, until it reaches this door opening into the stomach. When it is safe within, it will stay there if it is good and well prepared, but if it is only partly chewed, or will hurt you, after a little while the stomach throws open its upper door again and sends it up the gullet and out of the mouth in a hurry. This makes us feel sick, and is very unpleasant; but it is better than to keep it in the body. You must be careful, then, what you eat, and how you eat. You will be told what will hurt you, what you must not eat; and you must not eat too fast and swallow great bits without thorough chewing with your sharp teeth. Do you like to eat, Teddy?

Teddy. — Yes, when I am hungry, or have something very nice.

Teacher. — How stupid it would be to eat if we did not enjoy it! We should forget or neglect it,

and our bodies would have nothing to make blood of ; but our sense of taste makes it pleasant.

Now the good food stays in the stomach two or three hours and is stirred about by the movement of the muscles of the stomach, and mixed with a juice that comes from the lining of the stomach, called the *gastric juice*. After this it is soft and gray, and ready to go through the lower door of the stomach into another part of the food-organs, the *bowels*, which are below the diaphragm and in another cavity of the body, called the *abdomen*. In this cavity, which is less protected than the chest, are the *bowels*, the *liver*, the *pancreas*, and some other organs not belonging to the change of the food into blood. While the food is in the bowels, juices from the liver and from the pancreas mix with it. A greenish yellow juice, called bile, comes from the liver, and the food is changed, while it is passing through the long, coiled tube of the bowels, into something thin and white which is drawn from the bowels through little tubes into a larger tube which empties it into the heart to be mixed with the blood.

This is the way by which your lunch which you may now eat is changed into blood that can

become a part of your body, and all these organs which work upon it are called the *digestive organs*. Breathe good air, sleep, rest, exercise, and eat well, and you will be well, and happy, and useful, and, I think, *good*.

CHAPTER XII.

THE PRIMARY TEACHER: HER WORK AND HER FITNESS FOR IT.

I.

It is a good omen for the future that the question — Who shall teach the little children? — is at last thrown into prominence. If its importance is beginning to be appreciated by thoughtful educators, we may feel that the axe is laid at the root of the tree, and that the evils of its neglect will be finally eradicated.

It is well understood by those who have watched the development of human life that the first ten years do more toward shaping individual character and destiny than any subsequent decade; that, as a rule, the proclivities and desires, the tastes and aims, the habits of thought and feeling, are pretty clearly indicated, and the course of after life determined, by the environment and training up to that period. If a generation of girls and boys could be put during that time under

the highest moral influences, the most intelligent methods of intellectual culture, and the refinements of pure social intercourse, one might vouch for the nobility of the next generation of men and women, and the safety of society.

How much has the question of the quality of the primary-school teacher to do with this proposition? It is certain that heredity is a strong and uncontrollable element in the problem, home life is its sequel, and not tangibly within our grasp; but for the greater part of the growing and waking hours of the children's lives they are directly in the hands of the public-school teachers. What a profound responsibility, therefore, connects itself with the work of these teachers, — the welfare of the next generation, the destiny of a race!

Strangely enough, the importance of the influences surrounding early childhood is scarcely felt, even by mothers. Too many of the children of wealthy and cultured homes are left to the oversight and companionship of incompetent, perhaps vulgar, persons. Thoughtless women thus despise the privilege of motherhood. The great mother-heart of Fröbel has shown in his "Mother-songs" a glimpse of the education the

babes may receive in their mothers' loving arms, and which the mothers may receive in prodigal return from the little ministering angels who cling to them in that faith in the mother which Nature gives. The finest thing the mother can bring from her heart or brain is dignified by being given to her child, and not learned in vain if learned for him.

See, then, the breadth and depth and height of the work of the Primary Teacher! It is to form character, brain, and social life, not for one child alone, — that, indeed, were a task of infinite value, — but for scores of children who rest in her hands like the plastic clay in the hands of the sculptor. What a fine and strong ideal must she be capable of forming; what clear discrimination must she be able to exercise, that she may conform that ideal to individual possibilities, and the indications of nature in each hidden germ of personality! What untiring zeal and enthusiasm does she need for rescuing God's purpose from failure in the many lives so put within her developing hand! Indeed, the opportunity of the primary-school teacher is a great and heavenly one, and dignifies the noblest life of womanhood.

lead the child so that he will know the way again ! He is the complete master of an art who can make it appear easy and natural.

The primary teacher must possess a crystallizing power which results in organization and discipline till the assemblage of children is transformed into the school, and the parts become members of a whole. She is set among them as a magnet is laid on a paper of steel-filings ; they must obey insensibly the current of her polarization. Through what subtle sympathy, tact, and insight must this controlling power be exercised ! It is the organic force which gives life ; the teacher must be the spirit of the school, producing order and unity and growth. The essential germ of school-life is the controlling sympathy of the spirit with the body, of the teacher with the pupils ; her presence must be an inspiration, her influence a deep and strong centric force acting through the warmth of love, and dying in the chill of disaffection and weariness.

Let the primary teacher, then, seek constant inspiration for herself ; in the zest of fresh learning, in the draught of thought from all its fountains, in the cheery influences of nature and social

life; above all, in the comfort, rest, and illumination of the ever-present source of inspiration which is the atmosphere of all spirits strong to love and to guide.

III.

HAVING considered the dignity and general scope of the work of the primary teacher, let us inquire what are some of its details, and the demands it makes upon her mental gifts and moral calibre.

I suppose a young lady of that elevation of character and enthusiasm of moral purpose which seems essential to the conduct of such a noble work as we have indicated, to be placed before a promiscuous gathering of fifty or sixty children out of the public schools. The first demand is for immediate organization. Whatever else is postponed, the task of reducing this babbling crowd to order cannot be delayed. Nothing can be done until all are seated; then a quiet, orderly attention must be compelled, and perfect acquiescence in the authority of the teacher. It may be thought that this is an easy matter, but to many

it is an impossibility. At this exigency there is required an executive ability, a power of leadership, a personal magnetism, an inherent faith in herself, which is the pre-eminent qualification of a true-born teacher. It is not a common gift ; it is not the necessary concomitant of a fine intellect or of a beautiful character ; but an expression of the balancing of the faculties, a native poise which acts like an instinct to a great extent. Its possessor may be blindly conscious of it ; yet, on deliberation, doubtful of its possession until she comes into a position which calls for its exercise ; then there is no further uncertainty ; she can trust implicitly to it, assured of success. The gifts of mastery and organization are inborn, and are the momentum of a well rounded nature impelled by a steady motive power. One may learn their methods of application when she has their essence within her ; but no culture can engraft the gifts themselves. When one who knows she holds these forces in her hand stands before an uncontrolled horde with the purpose of bringing order out of chaos, there is a tacit appreciation of the power by all within its influence, a conscious recognition of it by older minds, an unconscious


acceptation of it by younger but more impressible beings ; they feel that they are to obey, and she to direct, in the very nature of things. The snarl and disorder of all the tangled threads of individual assertion unwind and divide, to unite in harmonious system. Like the type-distributer into which the printer's pi is cast, it regulates and sends each element to its own place, noiselessly, and with exact fitness. Let another attempt the same office, and all is failure and confusion ; the hum of disorder does not cease ; the indifference and inevitable defiance of even children, placed under inadequate authority, deepens and becomes appalling, while she finds herself powerless to quell the tumult ; the force of her presence has made no impression upon them. Every successful teacher can look back to moments in her experience when a pause, a doubt, a suggestion of insubordination, seemed imminent ; but acting only as a stimulus to her will, evoked a quiet passion of determination which made her mastery complete and permanent.

See, for example, a fair, delicately bred girl, fresh from normal school honors, ushered into her first school as teacher. It is a high school for

both sexes, about one hundred and sixty in number. It is the occasion of its inauguration as the first high school in the county; all the principal citizens are present, with many others interested in the project. As the young teacher takes her seat upon the platform, a maiden stranger amidst these men of weight and influence, her only companion there the principal of the school, — a man of middle life and long experience, — and no face in the room that she has ever seen before this eventful day, she for the first time is struck down from the absorbed inspiration of her consecrated purpose, and trembles as she looks around. “Ah, I am so incompetent! why did I come here? what shall I do when those great boys refuse to mind me?” These throbs of self-distrust make her shiver like an aspen for a while, and as the interminable speeches go on, the curious eyes of pupils and parents disconcert her; although she looks with apparent calmness into the faces before her, she trembles indeed, and for the first time loses faith; but when she is called upon to lead half the school to a separate school-room and take them in sole charge, the emergency summons all her reserves of nerve and will;

the tremor of doubt is swept away by a great wave of assurance, and when she stands before those over whom, though scarcely separated by years, she has been placed in authority, her strength seems to her invulnerable. With quiet mien, but with unflinching firmness, she meets each gaze of inquiry, and checks each glance of doubtful scrutiny; her genius for control has asserted itself, and the reins are firmly within her thrilling grasp. All serious issue between her scholars and herself is forever silenced. Her clear, quiet tones break the confirmed hush, as she directs them to the work of the hour; the few older boys, who have been the terror of the district school, look about hesitatingly, to find that their *rôle* is left out, and loyalty is their best subterfuge; while all gravitate unconsciously to control, as a disordered heap of steel-filings arrange themselves about the magnetic needle laid upon them, in lines of order and symmetry.

This power of control and organization is still more spontaneous in its exercise and complete in its influence upon an assemblage of younger children. About two hundred girls had been gathered from the alleys and cellars of a city by



benevolent and cultured young ladies and brought together to form a sewing-school. Not one of the young ladies present could succeed in reducing them to sufficient quiet to make any directions heard. One after another had tried in vain; some rang the bell loudly; others rapped on the table; others attempted to raise their voices above the general uproar; others went among the horde and tried to persuade. But all was of no avail; nothing was done toward organizing the unruly crowd until the youngest teacher arrived late; her companions came to her in dismay. "What can we do? We have tried our best to bring them to order, but they will not hear, nor even sit down; do try, if you can do anything." This young lady knew her power; it had been trained and proved. She stepped to the platform and asked the other teachers to be seated there. She then turned to the assemblage before her. She neither rang the bell nor spoke, but, coming forward as near to the seething surface as she could, she cast the force of that magnetic gift of mastery over the noisy elements. The lull began at once; like waves calmed by a gentle rain, one scholar after another dropped into a seat at the silent gesture of the

teacher ; in a few moments all were subdued ; the room was in order. Then, with an instant perception of the natural divisions and combinations of their various degrees of age and intelligence, she arranged them in classes ; with a nice adaptation of each to each, indicated their respective teachers. When some of the children were afterwards asked why they did not come to order before, they said, " We did as soon as the mistress came ; we weren't going to before." So she became the mistress of the school by this natural appointment, because the gifts of mastery and organization were in her, and she had learned how to use them.

The first appearance of a teacher before her pupils is usually a test of her possession of these essential faculties, but by no means the only occasion for their active use. They come into the arrangement of every class and the work of every hour, into the plan of each recitation and every phase of the relation between teacher and pupil. When their development is perfect the school will be destitute of any germ of insubordination, and every pupil responsive to the idea and will of the teacher. In a school of little children, the teacher acts like a true mother, and they hold to her as if

covered by her brooding heart and mind, breathing in a sweet atmosphere, while they bloom and ripen in unbroken content like rose-buds in the gardens of June.

The details of the work of the primary-school teacher would be hard to enumerate; but first and most apparent is the physical attention the children need in their appeal to the motherliness of the teacher. They must be clean before they can be orderly and good. I remember, in my nursery days, if we were restless and cross, mother would sometimes wash our faces and hands, brush our hair, and put on a clean apron, and the naughtiness disappeared; we could not have our clothes belie us, and we were renewed in spirit by the physical refreshment. I would not engage to be in any way agreeable or dutiful with grimy hands, a sticky face, and soiled clothes. The teacher will, in some way, attend to this prerequisite of good order. How can it be done with fifty children from homes where all this is neglected? I do not know, but I have known a teacher who did it for twenty years in a Boston primary school. This good woman had as thoroughly the feelings of a mother as though all th

had

been given her by God. She begged material when she could not buy it, cut out clothes for them, and her heart tugged at every cord that could lift them up. I have seen her sewing for them all the vacation, in the self-forgetfulness and unconscious devotion of a mother, until she died.

You may say this was the life of a missionary rather than of a public-school teacher; but, in many respects, the path of both is the same path, — the spirit should be the same spirit. Let the sense of justice (of those who deal with that question) measure the compensation which such a teacher should receive. I waive that matter now; but the teacher cannot think of her wages as her chief motive, or she is no true teacher. I foresee a possible charge of affectation in the consideration of this matter; but I could not really act toward children, or in the line of mental and moral influence upon others, with the idea of remuneration in any sense a motive. The motherly spirit and the missionary spirit will cover a great accumulation of the detail of the work of the primary-school teacher, and transfigure **most of** what seems the wear and tear and **drudgery of** that arduous position.

CHAPTER XIII.

AN ADDRESS TO PRIMARY-SCHOOL TEACHERS.

PRIMARY-SCHOOL TEACHERS! my associates in this transcendent work, I have longed to have a word with you. I have always felt an enthusiasm for our profession, though, in the blindness of my early zeal, I confess to having had a comparative contempt for primary teaching; but after three years of teaching in the high school and academy, Providence sent me to school again to *unlearn* that false measurement of honors, at the cradle and in the nursery; so that, perchance, the time might come when I could distinguish between the high and the low, the great and the small, and perceive that the material of childhood is the finest material that a teacher can possibly have to work with, the primary school her greatest opportunity, and the honor of good work there the highest honor that she can hope to achieve.

As I pass through the city streets, I watch the

youngsters dodging the teams, sitting on the curbstone, trudging by the road, playing in the gutters; and I think, "These are the primary-school children who will go all dirty and boisterous to their teachers, and they will be at their wits' end to keep them attentive and tractable, and to obtain that result which shall be demanded at their hands." Fifty or sixty of these little Bohemians trooping in to you daily! I do not wonder at your discouragement. Reforms are needed; not *more* than twenty scholars to a teacher, the abolition of much of the statistics and numerical ranking, better salaries, and more personal independence; these are what you ought to have and will have at (God grant!) no distant day. In the meantime, you must bear up as best you may. The work you are called to do is above pay, and although you ought at the proper time to claim a just equivalent for the work if you prove yourself equal to it, yet keep this matter far from you as a motive; it will take all the life and value out of your influence and your endeavors. You are doing the work because you love it, and would do it without pay rather than it should be left undone; it is too noble a work, and too **near your**

heart, to be measured by money. If you *merely* want high wages, and teach *only* because you can get your living by it, you are not a teacher in any high sense of the word. We must not be mere operatives or workers at a trade, but members of a profession, masters of an art; we must go into school with this consecration to our vocation, and we shall carry with us the fresh vitality which will give tone to the very poorest class of pupils, and the magnetism of our presence will crystallize even the rudest elements into order and symmetry, as the magnet, placed upon steel filings, converges them into lines of beauty. These restless elements before us are evidently ready to attend for an instant to almost anything that comes in their way. How natural, then, for the teacher to follow this hint of pleasurable excitement, of a succession of images, and appeal to their constant curiosity! Let her present things to the child as in a kaleidoscope; he will give his absorbed attention to this presentation of interesting phases in a prepared, but unannounced sequence, which will reveal more to him in a few minutes than an hour's task-work.

I believe in the "Natural methods," or, as they

are now called, "the New methods." Perhaps their more general diffusion is new, and all honor to the energy and positive apprehension of the man who has at last aroused the attention of the public in their behalf! The native restlessness of the child indicates the right course with him; a frequent change of theme, the senses leading, the mind following, growing and strengthening and rejoicing in acquiring knowledge concerning all which his senses or his imagination seize upon. Allow yourself to be in sympathy with the children; become yourself as a little child, abandon yourself to the happiness of receptivity, and be as one who inquires and studies with them. Yet one must be master of a subject to give it to a child, to stimulate his interest, to invest it with that *pleasurable excitement* which shall absorb his attention, to lead him by what he has seen to what he has not seen, to add fact to fact as a result of his power of inference,—not as one would pile stone upon stone, but as nature multiplies cells, and as mind evolves thought; so that the mind is working while storing up,—with a mechanical memory merely, but with *more* of the brain in harmonious and bal-

this is healthful and delightful. It is disproportionate and forced work, drudgery one way or another, which wearies and kills; the balanced activity of the brain, like the skilful playing of an instrument, keeps it in tune. The natural, not the morbid activity of a child's mind, is perfectly safe, and should not be discouraged but satisfied.

The question is often asked, "What should we attempt to teach young children?" To read, to write, to spell? Yes, they must have their tools, — the dishes first, on which the dinner shall be served. How shall these be taught? The old way or the new way, as the individual mind takes it best; some *see* how words are spelled, some *hear* better how; some want to analyze and get the letters first, others read at a glance, more by vivid impression of sight; but with a *strong desire* to read and write, and an aroused interest in things, they will soon learn by any method. I have seen many a child who read before its mother or teachers knew it, through the force of a spontaneous desire, almost as one insensibly acquires a foreign language by frequent rapid reading without translation. But while they are learning how to manage their tools they want food;

they will ask you all sorts of questions; no wide-awake child will rest satisfied with learning to read, write, and spell, or even to reckon, while he is waiting for the grammar school. He sees a thousand phenomena before him, and he is determined to know something about them; if you deny or hinder him you do all in your power to stultify him; you make him dull and stupid, if you do not drive him into wrong paths of inquiry. How many children are turned toward vice because prevented from learning what they have a right to be taught! You may take your class into the fields and woods: can you *avoid* teaching the essentials of structural botany? can you *escape* something of mineralogy and geology among the hills and along the rocky shores? can you shut their eyes and yours to the birds, the insects, the myriad forms in which Nature is constantly challenging them to learn and you to teach? It is astonishing how much of the essence of all the sciences, leaving out the technology, you can give a child in just those exigencies when he really wants to know, and when, because the knowledge comes at his command, he will be able and thereafter to command it. True, we have

all *our* knowledge at command, for these children to whom Nature is whispering her searching questions will soon drive us to our reserves. Do you, think you know enough to teach a class in physics in the high school? That may easily be, and yet you may not know half enough to teach it in a primary school. You may know enough of other sciences to fill a professor's chair, and often be forced to say, "I don't know" to a keen-eyed group of just these Bohemians the town turns into your school-room to be educated. I insist that the most accomplished scholar is not too learned to teach the primary school. Did not the elder Mill devote his great powers and acquisitions to the daily training of his three-year-old son, the little John Stuart, without a hint that the work was beneath him, — a school of one baby pupil for the most accomplished of scholars! To usher one mind upon the infinite vista of human learning *is* a great task for a great mind. Yes, you are in no danger of knowing too much for your primary classes. I have heard of the failure of attempts to teach by oral lessons. I have thought it like the failure to provide a sufficient meal from an empty larder, or the failure of an effort at

fine workmanship without trained and gifted workers.

But you may say your work is already set for you, — to appoint tasks, to fill up programmes, and put the wheels on the track for the grammar schools to attend to the machinery. If that is so, it is no less true that these are but parts of the husk, the shell only of your sphere of labor. There is a deep, vital work which is your God-commissioned work, and will remain to affect the whole life of your pupils. *The ardor for learning, the taste for beauty, the aspiration for character,* are all lying dormant in them, to be touched by your evoking hand. It is these springs and motives of growth that it should be our ambition to arouse, — these that are to determine the progress of the children and to mould the age into which they shall breathe their force and spirit hereafter. To kindle undying fires that shall purge, refine, and exalt the life of the next generation, — that is your province.

Even the mechanical part of your work will be better done for this inspiration. An elasticity of mind, and a subjection of the littlenesses that irritate both school and teacher, will unconsciously

emanate from your well poised nature, so that the results of discipline are often attained imperceptibly. Manners are taken by infection. The quiet lady who presides with polite consideration and unfailing courtesy will gradually develop that courtesy and kindness reciprocally. By your own gracious presence lead your pupils to admire what is refined, to recognize a lady whenever they may meet her, and to be gradually transformed into the same image. Lead them by your own personal example to see the unfitness of tawdry show, of pretence, of falsity in anything; your dress, your bearing, your habit of look and speech will be reflected in your school; your qualities will enter into its structure as the leaven into the flour. Let the glow of a cheerful face, a cordial sympathy, a pleasant humor, and even a hearty laugh, irradiate your school-room. It will freshen the air and invigorate both teachers and taught; and if a frequent play of wit is added to the prevailing sunshine, it will be as fascinating and awakening as the dazzle of a prism in the sunny room. Go into your school under an inspiration; educate your mind to be a clear channel for the truths of science and of nature; teach your heart to send

through the arteries of your school-life the love and the amenities of a beautiful character, and allow your soul to transmit the love and goodness of God, your indwelling presence. All that is good outwardly comes from what is true and beautiful inwardly. She can transform the rudest material to fineness who is truly refined, the most hardened to softness who deals with it tenderly. Be all that you would make your own children, and look at each child as if it were indeed your own.

CHAPTER XIV.

THE SCIENCE OF PRIMARY TEACHING.

I.

ANY discerning and thoughtful person who has watched with the absorbed intentness of parental interest the opening life of the human being cannot but have observed its most obvious endowments of body, mind, and soul, and the order in which they manifest themselves. If to the parental be added the scientific interest, this order will be carefully noted, and the method, condition, and sphere of activity of every faculty during the simplest stage of individual being will be discovered as a basis for psychological laws.

As the attention of the educational public is more and more called to such investigations, parents and teachers will learn to study more carefully the phenomena of the opening mind. In such study their sympathy and intelligent appreciation will develop a sure ground for true edu-

cational principles. The mother will no longer struggle blindly through the most important years of her relations with her children, marring the symmetry of nature's design, learning only by a series of irretrievable mistakes how to train the immortal being; the teacher will have a chart for his guidance on the infinite sea of human influence and endeavor, as it is thrown around the forming destiny of human life; and although earnest purpose and unremitting care can never be relinquished, yet they will be directed by unfailing law, and act amid the illuminations of established science. This will bring the repose of certainty to the anxious heart of the mother, and save her many a pang of self-accusation in the future, as she sees with pain the results of her ignorance in the blemished career of which she had cherished a spotless ideal in her young maternity. It will be no less valuable to the teacher to work in the realm of mind and soul with the assurance of the chemist in the laboratory, or the electrician acquainted with the laws of his material, which almost approaches in subtlety the essence which the teacher attempts to deal with in the school-room. Let the teacher and parent commence at

once, then, this all-important study of the laws of development of the human being.

The babe lies passive and almost unconscious in its mother's arms, as ignorant of his faculties and their uses as if the law of heredity had not come to his assistance. His connections with the outward world, and the advantages he may gain from them, are wholly unknown to him. The bee bursts from its cell prepared to carry out the aggregated wisdom of his species, to build its complicated cell, and put to immediate and effective use all its essential powers ; the young brute animal, master of its position in the first few hours of its air-breathing life, starts out with a mature inheritance, and is able to direct its muscular activity and exercise its intelligence as readily as its parent ; but the human child, with its eternally progressive life, proceeds very gradually to its inheritance, unfolds its powers, and accommodates itself to its position by slow stages. His mind and soul, as well as his body, are in the dawn of activity. The body offers the intelligence the only way to its environments. The child can acquire knowledge only by the avenues of his senses, and has first to discover by experiment how to use them. He opens the

organ of sight, and light attacks his consciousness, — not at once, perceptibly, but by degrees, through repeated opportunity. Through almost imperceptible developments of sensation he feels, and the existence of external matter is revealed to him ; he tastes and smells, and other facts respond ; he hears, and sound answers to his natural susceptibility. His training has begun ; Nature is faithful to him, and takes charge of his education from the first ; any other teaching must be in the direct line of her infallible methods. Brief and intermittent are the lessons ; the babe sleeps in utter rest, and then awakes to receive new accessions to his natural mental growth through the senses, and physical growth through the instincts. Perception, the first psychical act, is begun in the brain through its connection by the body with outward phenomena. Nature teaches by repeated presentation of the subject of observation, when the mind is rested and attentive to the sense-opportunity. If we would teach further, it must be under similar conditions and by the same plan. We may multiply the objects of observation, arouse desires, stimulate the sense, and respond to the instinctive desire of the child's soul for sympathetic enjoy-

ment. To light we can add color and motion, which will awaken attention and excite pleasurable activity of the sense of sight. The complication of ideas thus furnished to the mind makes a stronger impression and gives more complete knowledge, as well as trains and develops the sense which is the medium of ideas. Sympathy, attention, and fidelity to nature in the training of the infant mind and soul through the senses, is the first step in the scientific education of the child. The training of the senses is the beginning of the education of the body; the evolution of perception and consciousness, through the activity of the senses, is the beginning of mental education; and the awakening of love, desire, and will, through the sympathy of the parent or teacher, is the dawn of soul-education; all of which, so indissolubly connected, must progress harmoniously as nature has indicated by every sign of its methods with the childhood of the immortal human being.

II.

To proceed with the training of the senses, which forms so large a part of the earliest education, **the sense of sight** soon furnishes the brain

with ideas of light, form, color, and motion; the sense of sound conveys ideas of tone, perhaps of rhythm and harmony, according to the natural perfection of the organ and the susceptibility of the brain, or according to the judicious presentation by the teacher of the sound-vibrations; the sense of touch has given ideas of hardness, weight, resistance, surface, and figure; and the senses of taste and smell have contributed their appropriate but simple ideas. The work of the mother, who is the child's divinely appointed teacher at this period of its life, is to guard the organs of sense from injury, and to keep them in a healthy balance of rest and activity, according to the dictates of Nature. She will discover very early the principle that a rightly adjusted amount of exercise strengthens any organ or faculty of body, mind, or soul, and that over-exercise exhausts and impairs it. This is a fundamental principle, from which her methods may never vary. If she would strengthen any faculty, she must give it active exercise. She will apply this principle so as never to do for the child what it can do for itself to its better advantage, remembering, as an unvarying law, that knowledge, mental ability, and character are to

be acquired through activity of the intellectual and moral powers, and not through their receptivity. She will learn that enjoyment in the exercise of the faculties creates desire for more exercise, and gives vividness and tenacity to the impressions produced by that exercise. She finds at first that no attempt can be made to produce an idea in the child's mind except through the senses, and that most knowledge of the outward world is best conveyed to the mind, and most truly assimilated at all stages of its progress, by the direct application of the senses, by actual personal experiment, which is the type of Nature's lessons, and should be followed by the obedient student as the pattern of right education.

Let the child handle, smell, see, and even taste where it is safe; let him try all his instinctive devices for discovery; destruction of material may be the construction of mental attainment and power; incessant investigation is the order of nature for the child in his contact with the outward world, which is to furnish him with knowledge, with tools, with forces, and with power to use them. The province of the teacher as an aid to nature is to lead the mind to its material for

observation, to conduct as far as necessary the order of observation most conducive to clear impressions, and to direct to the same end the grouping or association of impressions.

As the education of the senses goes on, the brain receives a greater number and variety of ideas, obtained by perception through sensation; sight, sound, touch, smell, taste, produce more and more complicated images in the mind, until their strong segregation results in the conception of units or things of many qualities; also in the consciousness of those ideas and of outward material existences as the combination of those ideas; at last, identity, which is a consciousness of the knowing self, appears as a fact to the mind, and the child's relations with himself have begun. This is a great era in the education of the mind and of the soul, for all this time ideas of moral forces have taken root as the spring of character. Ideas of love and justice should both have been distinctly outlined in the child's understanding, and, by the help of the mother, fixed in the heart. Some notion of cause and effect, — of the necessity of cause, of the surety of effect; some idea of the authority of the parent and of the required

obedience of the child, should have been educed by the mother's training, through sympathy and responsive love, or through rewards and punishments, acting in the line of right or wrong doing, according to the natural connection of cause and effect.

There should be no arbitrary or variable dealing with the child's moral apprehension. Nature always preserves the similarity of kind even in punishing or rewarding, and is inflexible in assigning the instructive discipline of result. So should the teacher be, if she would evolve ideas of moral truth. She should present to the child's moral perception a living example of perfect truthfulness, justice, kindness, sympathy, and self-control, so that the moral perception of the child may receive ideas of goodness, truth, justice, love, and power, which shall be pure and eternal, for of these images given by the mother from her own soul, and through her training of her child's moral nature, he will in time form a union of ideas which shall give him his conception of the creative and sustaining Spirit of the universe, — the root of all his eternal outgrowth of character.

In this connection the training of the will has

its constant place. It must never be broken or forced into obedience through fear. That were to destroy the delicate lever of all the intricate machinery of development. It should be kept active, but subordinated to love as its earliest authority, afterward to its sense of justice and right, and its self-governing sense, which grows in the rightly educated soul as soon as it begins to discover its relations with itself. Obedience to authority through love,—first to the parent, afterward to the idea of a Supreme Creator, whose relations with the conscious spirit have become established by intelligent apprehension,—should be wrought into the habit of the child's actions by every influence of the parent or teacher; so the will may be made active in controlling desire and forming character even from the earliest childhood. So interwoven are the three constituent elements of human nature, so important the quality of the influences which are to develop them all harmoniously, that the teacher must never ignore one of them in the true science of education.

III.

ALL the sensations, perceptions, and impressions which establish the child's relations with himself and other entities, may be rendered more heterogeneous and definite by the teacher. The senses should be constantly educated to take in many qualities, their coherence and relations; impressions should be multiplied to give more and more complete images of objects, to enlarge the scope and perfect the quality of the knowledge obtained by observation through the senses. The education of the organs of sense should be constantly encouraged until they acquire facility and reach a high degree of sensitiveness. It were easy to prove that the susceptibility of the senses can be increased almost indefinitely, and the power of observation cultivated so as greatly to intensify and complicate perception. To approximate the full evolution of the physical powers is a fundamental part of human education. Nature is always inviting the child to the acquisition of ease and grace in every bodily movement; to the unconscious activity of the powers; to the full development of the senses; the thoroughness and

nicety of their application to their material; to the attainment of fineness and strength; to the habit of exactitude and infallibility in the use of the physical apparatus. The teacher can help in this direction from the first. Fröbel shows us how, — in the plays of the nursery and kindergarten, as he learned from the efforts and needs of the mother in training her child. The sight of the sailor, the naturalist, and the artist; the hearing of the savage, the woodsman, and the musician; the touch of the blind, all illustrate the advance to which attentive and well directed exercise may bring the senses as the media of accurate and complete perception. This part of the work of teaching may be so extended as to include the mastery of all the organs and functions of the body as instruments of mind, the control of the muscles, the healthy development of all the physical powers. This kind of education applies to the gymnasium, all kinds of industrial occupation, artistic training of the eye and hand, practice of every muscle and sinew, and conditions of the most perfect health of body. The functions of the body, the movements of every organ, should become as nearly automatic as

possible. The hand of the pianist, the foot of the dancer, the organs of articulation, the sight of the rapid reader, all acquire an unconscious accuracy and spontaneity of motion which is the result of habit, and much like the automatic movements of the vital organs of the body.

The instinct of the child demands constant exercise unceasingly toward this result of automatic action. And yet a wise regulation of all this exercise is an essential part of the teacher's work. No excess of material or of stimulus develops permanent power. A judicious letting alone or trusting to the sufficiency of Nature is often the right course for the teacher, whose judgment must always be guided by all the factors of the case; the temperament, the reserved bodily strength, the inherited tendencies, and other indications of the child's organization or development must determine the amount of the teacher's assistance. Her direction of Nature's forces cannot be too carefully adapted to the child's individual necessities. The play of the nursery, the out-of-door freedom of action, the occupations of the kindergarten, the object-lessons of the primary school, and the mechanical work of any kind to which the

child may be safely introduced, should be supplied in response to the demand of Nature and according to the measure of her desire. All the work which is given with a moral purpose should be in the natural channel of child-interests or given zest by some motive which acts as a cheering incentive.

In order to second Nature in the intellectual training of the child, the teacher may assist the mind in gaining strong and clear images by repetition and practice of knowledge, so that these images shall be more easily received until they come into play unconsciously in effective succession. The greater the facility of automatic mental action, the greater the power of the mind. We consider this kind of mental activity the highest within our knowledge. We must make it our ultimate object in the work of intellectual education, and aim to give the mind that final mastery over the organs of its activity which shall carry out all its great capabilities.

And in connection with the cultivation of the body with that of the mind, and of both with the education of the soul, we should take advantage of the best conditions for the presentation of the mental pabulum. When the faculties of the pupil

are stimulated by desire ; when the brain is fresh and unfatigued ; when its strength is renewed by a healthy flow of blood ; when the appetite for knowledge is awakened by the natural proximity of the subject for study ; when there comes that pleasurable excitement and effort of the faculties which is called out by responsive enjoyment, then such exercise will leave a more permanent and revivable image on the brain, and a true and lasting impression will be formed.

The soul craves sympathy, which the teacher should not fail to give, as it adds moral exercise to the mental, and furnishes the soul with the tonic of enthusiasm. We must listen to what the child has to tell, rejoice in his intellectual and moral victories, share his delight in the discovery of his powers. Thus we help him to win further victories in his mental and moral career, and experience fewer defeats of purpose.

IV.

IN all the work of teaching, the mind should be guarded against injury by too great, or long-continued, or unreasonable exertion. The bodily organs and functions should be kept in a health-

ful condition ; no faculty should be taxed to an unsymmetrical degree ; harmony of the bodily and mental development should be aimed at, so that one part of the being shall not defraud another, but each receive its fair share of vitality. There must be no cramming, no stimulating to the point of impairing the nervous strength ; nor should all minds be urged to the same plane of accomplishment. The individuality of the pupil must always be a strong factor in right education, and every tendency to mechanical grading is a baffling and defeat of the principles of psychology.

The healthful stimulus of sympathy should accompany study, — not the unhealthful one of rivalry, which is the one too often appealed to by grading and examinations of school-work.

The work of teaching is well begun by nature in the spontaneous methods of the nursery : the responsiveness and love of the mother, giving joyous emphasis to every new motion and attainment of the child, is a life-giving atmosphere, not only for the mind but for the soul. Let there be no thwarting of nature in her efforts to prepare

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the child for complete being,—the harmonious life of the body and soul. In even the earliest stage of development of the human body we see the germ of spiritual life; this is constantly evolved. Responsive joy and sympathy are the first steps in that work. The young soul makes its unconscious appeal to the mother, to the teacher, for love, for constancy, for truth; as she answers that appeal, so the soul receives these ideas, and forms an image which is as much a fundamental fact of soul-knowledge as the perceptions and the ideas they implant are the elements of whatever moral or religious structure the growing soul may build. The soul naturally believes in these perceptions as the mind does in sense-perceptions, and these faculties of the soul must be regarded as equally trustworthy with those of the mind and body. The instincts of the soul are true and reliable; no untrustworthy phenomena should be presented to destroy that faith of the soul in its instincts. Let the whole work of teaching continually build up faith in the certainty of knowledge obtained by the perceptions, by intuition and consciousness; this is one of the most invariable of nature's lessons. If we deceive the

child in any way,—if we admit anything less than the full truth to shine upon him, we do all in our power to impair the perfect faithfulness of nature's representation, and to confuse his idea of truth. We should present to the child's observation and faith the highest ideals of emotion and motive in our power, that his conceptions of love, truth, and goodness may be clear and vivid, and associated with sympathetic happiness.

We should carry out the plan of nature in connecting suffering with wrong-doing, and happiness with right doing. We must impart the knowledge of moral law through the natural penalties of breaking it, or the natural rewards of keeping it. We must learn of nature to let retributions fall in the channel of wrong action,—to make them of a kind with it, so that they shall become a part of the idea of right and wrong by association. We must make the soul's function of obedience to its instinctively recognized authority as nearly automatic as possible through unwavering habit in the earliest and most pliable period of existence. When the authority becomes consciously a divine one, it will supplement and finally supplant all others. As soon as the young

soul reaches the stage of self-consciousness, we should recognize the conscience as a divine authority for it, and appeal to it in all cases for the plan of thought, feeling, word, or action. We should lead the child to utter obedience to the rule of conscience, remembering that a vague treatment of the demands of conscience produces a vague image of right and wrong, and thus degrades the soul. Conscience will soon answer these appeals, and anticipate them by acting spontaneously upon all the child's moral relations as they come within his recognition : the relation to parent, teacher, and companion, to itself, and to God. Thus his connections with his fellows will be rightly adjusted, his connections with his Eternal Father will be more and more comprehended and made closer, and the just rule of moral responsibility will be attained through the exercise and development of conscience.

The teacher can also work in the realm of the natural passions and emotions, bringing motive and intelligence to their control. The excess of either can be shown to the child in its brute manifestations, that he may associate their uncontrol with horror, and understand to what

degradation it leads, and with what creatures the unrestrained exercise of the passion would ally him; he can be led to think back from the plain tendency of self-indulgence, of intemperance, of selfishness, of covetousness, of greed and anger, of violence and brutishness, by examples of human beings who have followed bad tendencies until they are slaves of their passions and cannot escape from the power of sin. The certainty of loss of power over our bad impulses by yielding to them should be made very forcible to children, so as to act as a constant safeguard, and the acquired power of self-control which follows the exercise of it should be made a constant incentive to right action.

As soon as the child begins to inquire,—as he surely does when the ideas gained through sense-perception begin to accumulate,—of the origin and sustenance of all things, the image of one universal Creator and Sustainer should be presented to his consciousness; his own individual connection with this Being by instant dependence of life should be associated immediately with this image. This spiritual Personality he will invest with the most attractive ideas and attributes

within his knowledge, and his love and reverence will be aroused by this association. His spiritual consciousness, as well as his mental perception and intuitive ideas of causation, will make this idea a reality to him; let no profane teacher introduce a doubt into his consciousness; it is the atmosphere of his soul, and must be responded to by the teacher; it will guide him in the choice of truth, in the selection and assimilation of soul-nourishment, until it defines and controls his relations with all conscious and unconscious being.

A candid study of the normal development of the child-nature must confirm the actuality of this ever-present soul-image. The faithful and sufficient teacher will seek to minister to its demands as uniformly, consistently, and conscientiously as to the needs of mind and body. To work in the full light of psychological principles involves the attempt to develop and train the senses of the soul which connect the human being with its eternal relationships. The soul-faculties come within the legitimate scope of the teacher's work, and form the highest factor in the process of education. No unhappiness, no dread, no fear should enter into the image of the divine



Personality through the abnormal conceptions of the teacher ; no uncertainty of moral convictions, no doubt of religious perceptions, no unnatural impersonality should be offered by the teacher to blur the image which has been formed in the soul ; no obstacle should be thrust in the way of the child's religious progress. No secondary cause or medium of operation, as law of method or result, should usurp the throne or divide the power or obliterate the outline of the omnipresent Personality in all His works and in all His ways, the expression of His uniform methods acting upon all His material and immaterial creation. Pain and pleasure, all the experiences of consciousness, should add and accumulate force to the moral and religious perceptions, and to the distinctness and completeness of the image formed by the soul. We must build into the child's mind a desire and determination for truth, purity, love, and obedience to conscience, and produce as clear and attractive conceptions of these attributes as possible. We must answer by sympathetic suggestion all the questions which arise in his soul in connection with these conceptions and his intuitions. We must never fail

in candor, never make compromises with truth while acknowledging the limitations of human perception, which, though it will not mislead, must often prevent the perfect apprehension of spiritual truth. We must encourage the expectant attitude of the soul toward the solutions of a larger experience and more complete obedience, and the revelations of eternity. We must teach faith in the soul's convictions at every stage of its progress, faith in the integrity of God's expressions through the laws and operations of nature and their analogy to spiritual life by reason of the harmony of God's plans; and we must inculcate an utter trust in the unchangeable relations of the soul with its Maker. We must enlarge and not cramp the activities of the soul, combining them with all other activities so that there shall be no morbid or disproportionate development, but so that harmony of being shall produce happiness and health, and tend to the rectification of all errors of thought, feeling, or action.

In the whole work of teaching, — not excepting but, on the contrary, emphasizing, the earlier period, — the development and strengthening of the moral powers, the evolution of a dominant

and permeating spirit of truth, purity, reverence, and love, the building up of the character, the nourishment of the soul, should be the highest object, because the supreme and immortal germ of human life.

V.

THE training of the will is secondary in importance only to the training of the soul. It is the agent of the mind and soul, and must be able at their call to control the appetites, the passions, conduct, and desires, as well as to direct the muscles, the senses, and the thought. It therefore constructs the mental and moral habit, which at last determines the quality and destiny of the immortal being. Force of will is indispensable to strength of character or effectiveness of intellect, and, in a great measure, to the healthful activity of the physical functions. It is yet an unsettled problem how far the condition of the body is dependent on the will, but the tendency of hygienic science emphasizes that dependence more and more. An attractive and promising youth often comes to a barren maturity through an undeveloped will, and again an undisciplined w

often leads to self-destruction; in either case the failure to educate and train the will makes a failure of life itself.

A culture of the will is a necessity of right culture for body, mind, and soul. It must be remembered that the fundamental law of growth by exercise is as applicable to the will as to any other power of man or nature. The will must be kept active in the child by leading him to determine and work for himself. If he is driven blindly to the accomplishment of the task set for him, he will never develop the power to set tasks for himself and put himself to work, which is his only chance for real achievement of either power or result. Give motive and stimulus sufficient to arouse the will until it commands the faculties successfully. It is immediate, clear, and decisive action which best defines the mental and moral ideas, executes their purposes, and evolves the will-power. Indecision, postponement, and evasion make the will weak and gradually powerless to control the activities. Children should not be advised when they are competent to advise themselves, but thrown upon their own resources for determination of all things as far as possible. The

child who prefers to have questions of conduct or thought decided for him, who always asks to be told what to do, and how and when to do it, should be denied all such help where he has the means of judging and acting without it. A habit of promptness in decision and action is a great step in the education of the will. The psychologic law that habit tends to automatic action is as applicable to the will as to the mind or body; this law may be presented and illustrated so as to become a most effectual incentive to the right exercise of the will in directing and controlling all the faculties. This automatic tendency is the key to destiny, for by its law habit becomes fixed in an unchangeable state of mind and character which even desire has no power to prevent or terminate, and the man becomes the victim of his unregulated or feeble will.

The right development of the will must be the constant aim of the teacher, as it is the greatest hope for attainment of either intellect or character. If there is but a feeble will-power, the effort of the teacher at first must be mainly toward the strengthening of it. If it is accessible by the stimulus of interest and desire, by all

means attack it in that direction and through the safest channels ; but, if necessary, develop it by the spur of antagonism and resistance, as Nature so often does. When we see the waif cast upon the selfish world, fighting his defenceless way to manhood, we may abate some of our pity as we observe how Nature is training it by struggle and adversity to strength and victory over the adverse world and its own rude material, so that he may, by the force of his developed will, win the position to which the most cultured look with envy.

When we see the cuffs and abuses, the conflicts and mercilessness of the boys who meet in the streets and the schools, we wonder why Nature seems to treat them so roughly ; but we must believe that all the instincts are wisely given and for purposes of training, and that they need only to be subordinated to reason and conscience, — not to be crushed or obliterated. Pugnacity, so natural to the boy, and so developed in one who has only himself to rely upon, is a valuable stimulant to the will ; and even fighting is beneficial to arouse decision and tenacity of conviction, and to develop that force of struggle, of resistance, of ~~termination~~ and energy, so essential for the

rectification of wrong habits and the acquisition of right ones; and, when the contest is defensive and necessary to self-respect, or to the championship of men or principles whose cause is just, it should not be prevented or discouraged. The pugnacious or combative instinct has been the lever with which Nature has lifted many an otherwise untrained human being into strong and complete manhood.

Taste in all its applications and manifestations may be cultivated through every period and phase of education. Facility for true and beautiful expression in language, manners, and art may be the object of education from the first; all the child's plays and enjoyments offer a field for the exercise of such facility. Forms and qualities of beauty may be constantly pointed out to him, the best models may surround him, and his appreciation of true standards be developed. Efforts of expression, however crude, should be encouraged; improvements always aimed at, although not to the point of discouragement. The outward should express the inward in the most attractive forms possible to the child's conception. When an utterly true and spontaneous blossoming of a

beautiful thought or feeling occurs, as it sometimes does in a child's progressive achievement as the harmonious result of mental or moral habit, the outlook of a mind and soul in free and joyous activity, then an idea of reverence for it as a revelation of God should be associated with it, and the consciousness of inspiration be recognized by the child.

It is the whole human organism, in all its powers, connections, and aims, which is the material of the work of teaching; and every element should hold in the effort of the teacher its rightly adjusted and proportionate place from the earliest period of education. Sympathy, — not indifference, antagonism, or hostility, — should be the medium of the teacher's influence. Desire for the pupil's advancement will awaken desire in him for that end, courage arouse courage, determination evoke determination; joy in the teacher's heart will communicate its stimulus and lead to victory; enthusiasm will kindle enthusiasm and create a vital atmosphere in which the child's being expands almost unconsciously. Intelligence should precede memory; imagination should accompany recollection; Nature never set a child

to learn by rote ; those things which must finally be subjected to an act of memory should be approached as a discovery, as the symbol of ideas. Respect for the common-sense of mankind, faith in its formulated experiences, will grow out of an intelligent attention to results of thought and conduct, until rules of science, codes of morals, maxims of conduct, will be accepted as guides for action.

The written statement of the results of observation, of the spontaneous course of thought, of the deductions of reason, of the play of imagination, should often be called for by the teacher ; this practice will lead up to an appreciation of the value of books as the statements of experts ; it will also encourage individual expression and a respect for the claims of the individual being, which should be a fundamental principle for the teacher: the *school for the child*, — not the child for the school. Lead the child to correct his independence by the claims of social obligation and civil order, but, nevertheless, to rest in his own personality, to become free in the movements of his own mind and soul, while conscience and reason show him how to hinder no other individu-

ality. Lead him to find and use his own material for physical, mental, and moral growth ; to adopt laws for himself and obey them. Train him to study and act for himself, and for ends he himself has fixed ; and finally, to “get his own living,” both mortal and immortal.

CHAPTER XV.

PARABLES. — LAWS OF NATURE AND LIFE, OR SCIENCE APPLIED TO CHARACTER.

“For the invisible things of Him from the creation of the world are clearly seen, being understood from the things that are made.” — *Romans, i. 20.*

PARABLE I.

IN the springtime of the year I went out into the fields. The farmers were sowing seed of corn, of wheat, of oats, and of rye. They selected the seed with care, planting each kind in its own field.

In the autumn I went again to the fields, and, behold! the waving corn covered the ground where corn was sown, and wheat nodded over the acres where the wheat-seed had been dropped; the rye and the oats had not disappointed the farmer, but had sprung up from the carefully selected seed just as he had determined; that which he had planted stood ready for the reaper, and no mistake had been made.

Then I looked at my young children in the

springtime of life, and I said, "We must select the seed of thought and feeling, of study and conduct, with the greatest care. We must sow the seed of unselfish desires, pure feelings, right motives, and high thoughts, so that good actions, pure hearts, and right conduct shall spring up in their lives; so that sweet manners, beautiful characters, and lovely souls shall bloom and ripen in these life-fields, and a harvest of good and noble men and women may be made fit for immortality. Let us make no mistake in our seed-sowing, for we find this to be one of God's eternal laws: *Whatsoever a man soweth that shall he reap.*

PARABLE II.

I often walked near the fields while the summer came on and the young corn was growing. I saw the farmer work early and late in his fields to loosen the soil, to cast out the weeds, and to guard against all manner of danger. I saw how diligent he must be in his business, watching and working and waiting, lest the harvest should be a poor one, and he should lose his labor; so I knew that **constant and faithful effort** is necessary to


success. Then I longed to see the children earnest and diligent, industrious and careful, both in their study and in their behavior; for the fields of the mind and the heart planted with the precious seeds of knowledge and virtue need even more care than fields of corn, to keep out the weeds of wrong-doing and forgetfulness and laziness, lest the harvest of manhood and womanhood prove poor and worthless, and the promise of youth be destroyed.

For I knew it to be one of God's eternal laws, both of nature and life, that *watchfulness and diligence are necessary to success.*

PARABLE OF SOLOMON.

I went by the field of the slothful, and by the vineyard of the man void of understanding, and lo! it was all grown over with thorns, and nettles had covered the face thereof, and the stone wall thereof was broken down. Then I saw and considered it well; I looked upon it and received instruction.

Yet a little sleep and a little slumber and a little folding of the hands to sleep, so shall thy poverty come as one that travaileth and thy want as an armed man.



PARABLE III.

I held a little brown flax-seed in my fingers. I dropped it on the surface of the water in my glass, upheld by a thin layer of cotton-wool. In a few days white threads descended into the water from that little seed, and a green shoot rose into the air. Delicate leaves unfolded above and the threads below became a silky tassel of roots. The pretty plant grew and throve. Day by day the leaves opened more and more. Buds and lovely blue flowers appeared, and as the sun shone in my window upon the growing plant, seeds were born and ripened and the wonder was multiplied. All had gone on by degrees. Step by step, cell by cell, it had been built up, and bud and flower and fruit had come in due course. So I knew what to expect in my little human plants. Not the ripe seed all at once; not the perfect conduct nor the whole lesson at the first trial; but slowly, one by one, thought by thought, effort by effort, the mind and heart will grow. Surely but gradually, day after day and year after year, the child will learn and become wise and good; for this is God's eternal law, that *all things grow*
in order, from less to more.

So the child who does not use his mind-eyes, who does not observe and think and learn, will grow blind-minded. His bright powers will become dull. He will never be able to see all the beauty and wonder of the universe, because he has lost those eyes of the mind and soul which God gave him with which to perceive goodness and truth. He will become like the eyeless fish, dark and unknowing amid all the glowing beauty about him, with only a dead scar to show his unused faculty. Poor little sightless mind that would not use its eyes of thought! *What is not used dies at last.*

PARABLE V.

One day as I stood by the sea, a swarm of glorious insects filled the air; they were each like a tiny steel-blue needle, darting through the sunshine; their wings were like silver tissue, their eyes like globes of light; I wondered whence they came.

Then a naturalist pointed out to me a muddy pool, and on the dull bottom I saw some brown, scrawny beetles, moving slowly by jerks through the thick water. "These," he said, "will all

become dragon-flies, the beautiful creatures you see flying in light: hidden within each scaly form below is a folded germ which shall one day burst the shell and come forth into the air in all its beauty, to float over land and sea in light and glory.

Now, when the children are full and stupid, or rude and naughty, and seem to choose the dark bottom of ignorance and evil, I comfort myself with the idea of the folded soul within them, like the dragon-flies in the beetles, hoping it will grow within them. I would not have them lo or think ought to mar those gauzy wings and far-seeing eyes of the soul that wait to burst forth into light and purity. I fear lest they should put out one single globe of those great hundred-fold soul-eyes. "Oh," I say, "dear children, drive out of your hearts all bad thoughts, all selfish feelings, and do not harm that beautiful folded thing within you that is waiting to escape, for it is your soul, and *what shall a man give in exchange for his soul?*"

PARABLE VI.

I saw, too, in regard to the beetles of the dragon-flies, that they did not need to attend to how the germ within them should grow ; they had only to act as beetles and do what they were fitted to do in the muddy pond. God took care that all should come out right about the dragon-fly, if only the beetle took care of his work as a beetle.

So I saw that the children had only to do what is right for children, in children's places and by children's ways. God will take care for the unfolding of the wings of the great many-eyed soul, if only the children do as they are bid and behave as well as they can ; for *God does His work for us while we are doing ours for Him.*

PARABLE OF PAUL.

That which thou sowest is not quickened, except it die ; and that which thou sowest, thou sowest not that body which shall be, but bare grain, it may chance of wheat, or of some other grain ; but God giveth it a body as it hath pleased Him, and to every seed its own body.

So is also the resurrection of the dead. It is sown in corruption, it is raised in incorruption ; it is sown in dishonor, it is raised in glory ; it is sown in weakness, it is raised in power ; it is sown a natural body, it is raised a spiritual body. — [1 *Corinthians*, xv. 36.]

PARABLE VII.

I heard a man say that the baby was dead and would never know anything again. I could not believe it, for I saw the corn growing out of the quiet seeds,—a new life out of the old ; I saw the dragon-fly which broke forth from the dead grub-case where it had been hidden during the grub's life ; I also saw the butterfly spread its wings from the lifeless chrysalis ; and so I was sure that the dead should come to life, perhaps to a different life, a more beautiful life, with new and more perfect bodies of which we cannot conceive now ; but of this I am sure, that the truths of God in nature are but pictures or images of His truth in the unseen universe, and the butterfly is God's word for Resurrection.

“For the dead shall be raised incorruptible, and we shall be changed.” “As we have borne

the image of the earthy, we shall also bear the image of the heavenly."

PARABLE VIII.

I sat by the rock at the sea-shore, and, as I picked up the pretty pebbles and looked on the huge cliffs, I said to myself: They are strong and good, nevertheless they are broken by the waves, nor can they grow and renew themselves like the cedar, or even the little pimpernel that opens its blood-red eye amid the sands. The flower and the tree have a higher nature than the rocks, for they grow and leave seed to grow again, and have an enduring wholeness and pattern of their own which is forever born again, while the cliff breaks into rocks, the rocks are rolled into pebbles, and the pebbles are washed into sand, so that instead of growth is separation, disintegration for unity, destruction rather than life.

But a voice came to me from the pimpernel and the cedar, saying: "The sand and the pebble and the rock may also become as we if they will take hold of our helping hands; for that are we sent to them. We call them through every little pore and cell, and reach down to them by every

lift them up, they climb by the roots of a higher nature, they rise from a lower into a higher kingdom.

For all who will ask and try may ascend and be born again into a nobler life. *"Ask and ye shall receive, seek and ye shall find, knock and it shall be opened unto you."*

PARABLE IX.

My little daughter brought in beautiful white lilies from the garden, and placed them in a vase before me ; Day lilies and Japanese lilies, exquisite and pure in their loveliness.

And when I had observed their delicious fragrance, their graceful outlines, and their queenly beauty, I examined them more carefully, to see how they were made.

Then I found that all the parts were arranged in a most orderly and regular way, and that each flower was made exactly according to the pattern. The flower was in threes: the petals three, the sepals three, the stamens six, and the stigma in three divisions. Its construction was orderly, harmonious, and symmetrical, as is every

work of God. *Order and harmony are laws of God in Nature ; so must they be in life.*

I noticed especially in the Japanese lily the anthers vibrating on the stamens so delicately poised, and on examination I perceived a purpose and design in this beautiful contrivance ; it was so adjusted that the pollen, the rich brown dust which ripens into seeds within the ovary, might be shaken down upon the sensitive stigma to be received into the ovary.

Now I knew that all God's works have design and purpose in their adjustment. Our life, as well as that of the lily, is arranged and contrived for a useful end by God, who, though omnipotent, yet deigns to form the lily as carefully as if that were His only work. In everything, so the lily taught me, *God has a loving purpose and a wise design.*

PARABLE X.

" Consider the lilies, how they grow."

I saw again the lovely blossoms, to study them still more, for they were full of God's lessons. I saw the like parts to be opposite and to correspond ; I saw that, though distinct from each

other, they were in a manner together and united. The flower was a union of opposites, and much of its order and beauty was owing to this union of opposites.

So I learned that all unities are made up of distinct parts, and that the most beautiful thing, or unity, is the harmony or reconciliation of opposites; and I was glad to think that the human soul, which sometimes seems so far from God, may also be reconciled to Him, and, like the flower, produce a beautiful union, a harmony of opposites. I learned that all that seems discordant, separate, or opposite in life, — as, for example, good and evil, love and hate, pain and pleasure, suffering and joy, — may be reconciled to each other, and, by their union, produce the most beautiful and perfect life.

This is a hard saying, but it is the law of God, in nature and in life, that the most perfect union is the reconciliation of opposites; so I taught the children to look for that union in nature, and to seek it in life, for it is the fulfilment of God's eternal law.

Love is the fulfilling of the law.

PARABLE XI.

I walked with a geologist through a mountain region: great granite hills were piled up to the sky: the surface of their rocky slopes was covered with trees and shrubs, leaves and flowers; the crumbling outside had been converted into all this beautiful verdure and vegetable life. We often struck a bowlder with the hammer and saw its veins of mineral which furnished material for the glorious forests that garlanded the mountain-chain. At last my friend, by the blow of his hammer, revealed a beautiful gem hidden in the heart of the granite. "Here it is!" he said, and handed me the crystal. All its sides were perfect; its form a miracle of geometric perfection; its clearness and glowing lustre like the very soul of light and glory.

Then it flashed upon my mind that the heart of the bowlder was so far from any opportunity to grow from the outside into the beautiful plant-life, it was so deeply hidden and shut up to itself, that all its energies had to work inward, and had concentrated themselves in this work of perfecting and transforming the rock until it had become the very essence of light and beauty.

Now, why should I suddenly think of my little darling lame and sick child, alone in her poor home, shut away from learning, and from the pleasures of childhood, helpless and inactive as to her outward life, but so patient, so hopeful, so sweet and trusting and loving as to remind me of heaven when I went to sit down by her bedside? Why but that she was like the hidden gem whose forces, not being able to reach out into life, had been used by God to transfigure her soul until it shines like a pure and perfect jewel.

Therefore I would say to such as are shut out, — by poverty, by sickness, by circumstances, — from all that seems like growth and development, do not despair; God will make it up to you; all loss and trial He will compensate; your unspent forces may, by his grace, work inward upon your soul, to make it perfect in symmetry and light and beauty, one of God's hidden and precious jewels.

PARABLE XII.

I had travelled from day to day through the prairie-land of the West. I had seen its thousands of acres of growing grain; I had visited the great granaries, and seen the stored harvest; I had

passed by the beautiful vineyards, and had seen the rich fruitage and the vats of purple wine from the wine-press. "O bountiful nature!" I exclaimed, "bread and wine, corn and fruit, gold and purple wealth of the rich land thou dost offer to man for his abundant food."

At that I came to the noisy and crowded city, and visited the exchange. "What is all this hot and eager traffic, this contention and shouting?" I asked.

"It is buying and selling; it is the selfish greed of man dealing with the golden grain."

The grain waves beautiful still upon the harvest-field, or is heaped up in bushels of shining kernels in its granaries, or on the rail cars and lake steamers or canal boats; this is its voice speaking through the passions of man, and it is the voice of mixed good and evil, a discordant and warring tone.

I saw, also, men excited or helpless by using whiskey or wine, men who seemed changed to demons, drunken and bereft of manly self-control, and I remembered that the wine and the whiskey were also the fruit of the grain and the grape, converted to evil uses and made to degrade rather than to benefit mankind.

"Alas!" I said, "good may be changed to evil, right to wrong, beauty to ugliness, use to abuse, by the lust and passion of man. The tree of life which is in the midst of the garden of earth must also be to man the tree of the knowledge of good and evil. Forbidden fruit grows in the most beautiful of Nature's harvests, good and evil are on the same branch, and a man must choose between them. Each of us must make his choice at once.

Ye cannot serve God and mammon. Choose ye this day whom ye will serve.

PARABLE XIII.

I plucked a fresh leaf from the tree; all its cells were full, its veins firm and strong, its color vivid, and its outline perfect; it had grown steadily, supplied with sap from the stalk and plant; it was so beautiful I wished to keep it.

But soon it began to fade and dry; its life departed, its cells shrunk, its color vanished, and it was withered and brown and dead; then it crumbled to dust and blew away. It was necessary to its beauty and freshness that it

should remain connected with its source of life and strength.

Thus it is with the mind and soul. If they abandon and forget their source of nourishment, — books, observation, and thought for the mind, — high conduct, noble aims, communion with God for the soul, they will degenerate and decay and become like the withered leaf or idle chaff. *The branch cannot bear fruit of itself except it abide in the vine, neither can ye except ye abide in me,* said Jesus.

PARABLE XIV.

A little girl was taken sick; a swelling upon the knee made it necessary to keep her in bed for some months, and to keep her leg quite still.

"Now," said the doctor, "we must rub that leg often every day, or it will shrink and not grow as fast as the one that is well and can move about, for disuse weakens the muscles, and when they do not gain strength, they lose it."

So it is with the heart; if we are not loving what is good, we are losing the power to love it, and learning more and more to love the wrong; if we are not earnestly desiring and striving to do

our best, we are getting more and more inclined to do less than that, and tending more and more to do and to be our *worst*.

PARABLE XV.

High up in the clear sky flies the bluebird, among the first to herald the coming spring. He flies swiftly above the clouds, in sunshine and in storm, singing a joyous carol. His wings are the color of the deep blue sky, and here he and his tribe stay with their cheerful song from March to October, first to come, and last to go, and always finding something to be happy about, even in the early spring or the late autumn. He is like the cheerful and trustful soul that pursues its onward flight above the clouds of trouble through the clear sky of love and trust. It sings its sweetest songs when the cold winds of discouragement and disappointment blow about its path. It reaches its home at last safe and happy because trusting in God's care, and finds its shelter and food, though the whole earth looks empty and barren. It flies at the call of God, who never misleads it, but guides it through the trackless air safely to the very place where it would go.

Let us be like the bluebird, and be sure that as God guides him and sustains him, so He will guide and sustain the least of us if we do our duty cheerfully, and follow trustfully where He leads.

Jesus said, "Yet one of them does not fall to the ground without your Father. Are ye not much better than they?"

PARABLE XVI.

Behold the snow-flakes falling! They are so white, so feathery, one would think them light and formless as air; but, catch them in the hand, and look carefully, and you may see they are made of starry crystals of ice, shaped as carefully and beautifully as a flower.

And the flowers of summer, too, are they not arranged in beautiful order, — symmetrical, and balanced in every part, three petals, three sepals, a three-lobed stigma, and three or six stamens, as if all had been counted and fitted exactly to a pattern of beauty? And so it is exactly fitted to the thought of God. It is the same with the jewel in its hidden bed; God has cut it in lovely forms, as

the flower and the snow-crystal, according to His pattern of beauty for the world and for the soul, and the flower and the gem and the snow-flake all lend their forces and their particles to carry out His law, which moulds them into beauty and harmony.

Now behold the young hearts God has given you, and remember that He would mould them also into beauty, but you must lend Him your will and love and faithfulness to help Him do for you what He cannot do without your consent. Give Him your conscience to do everything exactly right ; your love to harmonize your soul with His, as the pure snow and the clear crystal and the lovely flower are in harmony with His plans for them ; your will in choosing pure influences, good habits and companions, and avoiding what is wrong ; then, as you grow up into men and women, you will have characters of symmetry, purity, and beauty, fitted to shine like the gem, to bloom like the flower, to hold up a lofty ideal as the snow-flake holds its delicate pattern of beauty clear and unbroken through wind and storm, that at last you may be set as jewels in God's everlasting crown.

“For the invisible things of Him from the foundation of the world are clearly seen, being understood from the things which are made.”

PARABLE XVII.

Oh, the pretty little Housatonias! a patch of their delicate stars here, a patch there, all over the low meadow. Let us look closely at them. In this patch we see four little stamen-tips held up even with the white cross made by the four lobes of the petal; in the next patch the two stigmas spread out above the opening corolla; the two kinds are always in different patches; the sort that shows the tips of the anthers and with the open corolla has a short style which brings the two stigmas half way up the tube of the corolla; the other sort has the anthers low and the stigmas high. The partridge-berry and the primrose have their flowers on the same plan; and we ask what the plan is for?

Now when the little insect, flying from clump to clump over the moist meadow, alights on these little violet-colored, dainty flowers for his breakfast, he pokes his tongue down into the tube for

the nectar, he gets his face smeared with pollen from the high anthers, and as he flies to the high stigmas, that pollen is rubbed off by them, which is just what was meant to be done, for the pollen will only ripen into seeds when left in the stigma ; also, as he gets the pollen from the low anthers he carries it to the flowers with the low stigmas ; so he finds the flowers contrived for his service as nicely as any plan can be devised for a certain end. So, if you look at the laurel with its nicely arranged corolla in such regular rosy points with the tips of the stamens bent over, each in its particular niche, you see a wonderful contrivance for the bee to carry the pollen from flower to flower ; for the filaments are so many springs which will remain until the flower fades, unless touched ; but as the bee jostles them in his search around the ovary at the bottom of the flower, they all start off and discharge their battery of pollen-dust over the body and legs of the bee. Try it with your finger, and see the shock with which the ten anthers project their grain as if shot from a pea-shooter. Then the dusty fellow flies to another blossom, and while he revolves about the stigma with his head in the

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works all things together for good to us ; we may wither as the bright laurel-bloom, but still we know God's purposes for us will ripen, and He has marked out every step of the way for us ; for His plans are kind and can never fail, and all our tears are counted by Him. He who makes such careful provision for the fruitage of the flowers contrives as well for us, though we see not how.

PARABLE XVIII.

Did you ever see a bee fly from flower to flower, sipping its nectar and gathering honey? Did you think it got its sweets for nothing? Did you suppose the flower said, "Yes, honey-bee, take all you want; I charge you nothing." No; if you could hear it, it would say in your ear, "I make Mr. Buzzer do a brother's work for me. While he pushes his yellow head into my pollen-tubes, and tips his tongue into my nectar-spurs, I dust him well with the pollen I want to send to my neighbors, and he carries it right easily for me, even if he doesn't know it. Sometimes I sprinkle his nose with my little globules; sometimes I stick bags of pollen hanging to his legs and poking out

like horns from his head ; sometimes I open a trap-door where he doesn't expect it, and he has to go out the back way to carry the load I have given him. Sometimes I touch a spring and discharge a volley of pollen at him as he is sipping or tucking away his wax-balls in his side-pockets, and he is covered all over with the merchandise I want him to carry to the waiting flowers, where he will be sure to go. I even get him to touch off the springs himself, which shoot the tiny yellow shot all over him, or fasten loads of it to his head, just where it will be left on the stigma of the next flower he enters. Ah ! we are cunning, and make the bee and the insect pay for all we give them."

Now, little butterfly children, you flying about the garden of youth, have to do your part in it, after all ; you cannot enjoy anything without working for it ; you cannot take without giving ; you must do your share, a brother's or sister's part. You cannot learn without work, or play without earning the right to it. Think of the gay, happy butterfly, and the busy bee, as they gather their sweets, and remember that as they take they give, as they carry and work for themselves they

carry and work for others, too, and no living creature can live for himself alone.

“For the invisible things of Him from the foundation of the world are clearly seen, being understood from the things which are made.”

PARABLE XIX.

Have you watched the twining vines, turning about to show their lovely blossoms? The morning-glory and nasturtium, the clematis, or the virginia creeper, peeping in and out our lattices, and holding themselves up as they seem to stand on tiptoe at our chamber windows; you see them reaching out their finger-like tendrils, feeling for a support, and then, getting a good hold, they twine around it and draw the whole vine that way until it grows firm and can never be drawn away.

I think of the vines and their tendrils as I look at my scholars; they, like the vines, are young and tender, and unable to grow up by themselves, but hold out clasping hands to others as the vines hold out their delicate tendrils. There are many who offer a hand to help the children climb; but there are also false supports, which give way just when they are most needed — and the vine, with

its bright flowers and rich fruits, falls in the dust, to be trampled on and spoiled. The little vine tendrils seem to know when to cling and what it will be unsafe to clasp. The growing tendril seeking a support often turns aside so as to make a clear sweep above what it would easily wind around. A wise man who has watched the slender passion-flower revolve says, "We may see with wonder that when a tendril comes round so that its base nears the stem, which it will not be safe to clasp, it stops short, rises stiffly upright until it passes by the stem, then comes back again and moves on so till it again approaches and again avoids what it must not entwine."

So children, as they put out their tendrils of thoughts and wishes, can choose what to cling to, and, if they have come near what is unsafe and will not give support, can stop short and swing above it, holding up their thoughts with a stiff will and resolve to avoid the wrong. Their clasping thought-tendrils will draw the whole vine toward what they have clung to, and the life will grow bent and strong in just that direction, until it is impossible ever to turn it aside. See the vine tendril twist and coil as it pulls the vine

closer and stronger to its tie! So the thoughts and inclinations of the child twist and coil into habits drawing the life and character as they will. Watch, then, your thoughts and desires that they do not reach out to false supports and twist and coil into unyielding habits which draw the soul to sure destruction, but let them climb ever up to the light of truth and purity under the clear air of heaven.

PARABLE XX.

I hardly knew that winter was gone, but, as I walked along the road where the willows grow, I noticed the furry buds alternate on the branches, so I broke off a few to put into my vase at home that I might watch them swell to yellow tassels as the days went by. The ends broken from the bough were wet, and, as I walked on, drops collected and fell from them. I knew it was the sap that had crept up the tiny tubes from the roots of the tree to carry life to every little twig and burst into bud and blossom. How wonderful, I thought, is the ascent of this life-giving sap in the veins of the brown and quiet stems! It rises without a sound or any promise of coming that we

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and the sap-wood not only in great quantities can be counted by the rings on the old trunks, but also in the little sap-wood of the new growth, not only in the old oaks of a thousand years, but in the young shoots glowing with deep red leaf-
 buds of the birch.

children, where it rises day by day, fuller and stronger, to make them grow better and more like green trees planted by the river, whose leaves shall not wither, and that bring forth fruit in their season.

PARABLE XXI.

There is a road on the shores of the Merrimac, not far from the home of the poet Whittier, which runs through a lovely stretch of pine woods called Follymill Woods. There you may find the earliest flowers of spring: the Hepatica; the Anemone; the Trientalis; the Solomon's Seal; the Strawbell; the Violet: and, most beautiful of all, the Epigea or Mayflower, in all its pink loveliness and delicious fragrance. You may go there when the March winds are chill, or patches of snow still lie in the hollows; not a green leaf has spread its blade nor the grass begun to spring forth, yet by pushing away the dead brown leaves from the stems, you will disclose the most delicate of the year's blossoms, the purple and pink Hepatica; it looks up from the brown mould like the trustful eye of childhood, wide open and beautiful as the clear sky above it. Like all the flowers I have

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timed. It seems fragile and tender, not ready for the struggle of life in the wide world that waits for it. But it comes forth at the call of its Maker as fresh and perfect as a kiss by the June sunshine and treasured upon by the delights of summer.

I like to pass the noon hours of late March or early April in the woods of Follymill, for the sweet breath of the pine, the sound of the hear over rising with the freshness of mountain snows melted into its swollen current, as well as the sweet young flowers at my feet, all tell me how near and how good is the Father and Creator of nature and of life. As He is close to the spring blossoms, and cares for their tender loveliness, as He protects their fragile forms from the cold winds and covers them with the dead leaves for warmth, or wraps their stems and buds in snowy flocks, so He watches over the children in their tender youth, and shelters them from storms of trouble, gives them hope and joy and love, like sweet, delicate petals unfolding to beautify life as the spring flowers beautify the woods of Follymill.

Jesus said, "If God so clothe the grass of the field, shall he not much more clothe you?"

PARABLE XXII.

A fresh green leaf stands up from the elm bough into the sunshine. As the light gleams through it I see somewhat of its pattern of beauty, its frame-work of veins so symmetrical, its margin of points so nicely cut, its delicate plaits so precise ; and I see still more, — that its fibre is filled in with little egg-like cells, all green and bubbling. What is going on in that pretty leaf ?

Ah, the leaf is an exquisite factory for the manufacture of plant-tissue. It is just packed with the green, translucent cells in which the very water of life seems to bubble and roll. Each cell is a little loom in the leaf-factory ; it does honest and busy work all day, the sun and air helping it, the sap flowing into it, and the tide of life pulsating through it. Each cell is not too small for God to come to with his gifts of life and light, nor too small to do its part of the work for the whole leaf ; but its one part is just as great and necessary as any other part, so it works away, weaving and building into the leaf, until its pattern of beauty and regularity, its unity and harmony are complete.

PARABLE XXIII.

I lay idly swaying in my hammock as the deep river rolled by ; the current was strong and swift, and rushing out to the sea not two miles away. I observed its steady rush, and thought of the force which had gathered it from the hills and brought it with greater and greater swiftness on its way to the ocean ; but when I looked again, the waters had turned on their course, and the salt waves seemed to be flooding the clear river with a mightier power to push back its current again.

“That is the tide,” said my friend. “I sit here by the river-cliff and wonder at its mystery. Up it comes regularly, twice a day ; then back it goes, and the fresh mountain water speeds once more, unhindered, to the great home of waters. What does it mean, this ebb and flow, unremitting, forever ?”

“It means,” I said, “that the great law of Nature,— alternation, renovating change, — is the law of life ; rest and activity, night and day, sleep and waking, like the law of the pendulum measuring the time ; it is the direction of God’s hand in the working of the machinery of the universe ; His

finger on the wheels ; His swing in the pendulum. I copy it unconsciously as I swing here in the hammock ; my pulse beats to its touch ; my heart throbs with its motion ; the sea rushes up to the shores to tell us God's power is behind and within all, and that His way for us is that of regular ebb and flow. If sorrow comes for a night, joy returns in the morning. If we go too far in one way, we shall go just as far in the opposite ; and extreme leads to extreme. It is a law of health that we shall have this flood and this retreat of force, of feeling, of desire, and happiness. We must balance our rise and fall ; we must measure our motions as evenly and quietly as possible ; and let every alternation of life, every heart-beat, and every aspiration, remind us of the tide of God's love and power around us and within us."

"But," said my friend, "is it not of some far-off attraction and repulsion that the tide tells?"

"That may be, too," said I, "for who knows what far-off fact or event, what influence beyond our knowledge, draws us or drives us? Something which we have not the eye to see, which no telescope can reach ; something in our history before we were born : something in our destiny of

which we are quite ignorant, yet affects us every day and hour of our lives, — but it is all a part of God's leading or withholding; and near or far, small or great, is the secret touch of His finger upon the spring of our lives. Let our heart and all its influences respond to God's finger-touch, swing toward the high, even the unattainable; let our thoughts swell with their unceasing reach after heavenly things, — and their tides, like the ocean's, will invigorate and refresh the current of our lives."

The *law of balance*, Nature thus teaches us, is one of God's laws of progressive life, spiritual and physical.

PARABLE XXIV.

So, as we sat by the river, with the rushing, mighty tide coming up about the rocks and dashing its salt waves into the recesses, the evening came upon us. The river glowed with the sunset lights, and by and by reflected the great planet of evening broken into a thousand jewels by the play of waters. We talked and thought, perhaps with each other, perhaps with God, who seemed to have come so close in His tides and His stars and

the great blaze of His sunset glory. "There hangs the evening star," we said; "it is steady; and we have learned that it, with the other heavenly bodies, does not swing to and fro, but moves undisturbed in its great circles; in the beauty of the curve its motions are set and its path has no alternations." So in greater perfection of motion Nature pursues her course as her sphere of life ascends. The forces which draw the heavenly bodies are opposite indeed, but so truly balanced, so unbrokenly obeyed, that they move on in their orbits subject to no extremes, to no violence of motion, to no variation of aim, but with one eternal centre and an unwavering course about it. So the law of balance has become a *law of rest in motion*; and that is the law of the highest activity. To that may our life-course tend in the eternal progress of our souls.

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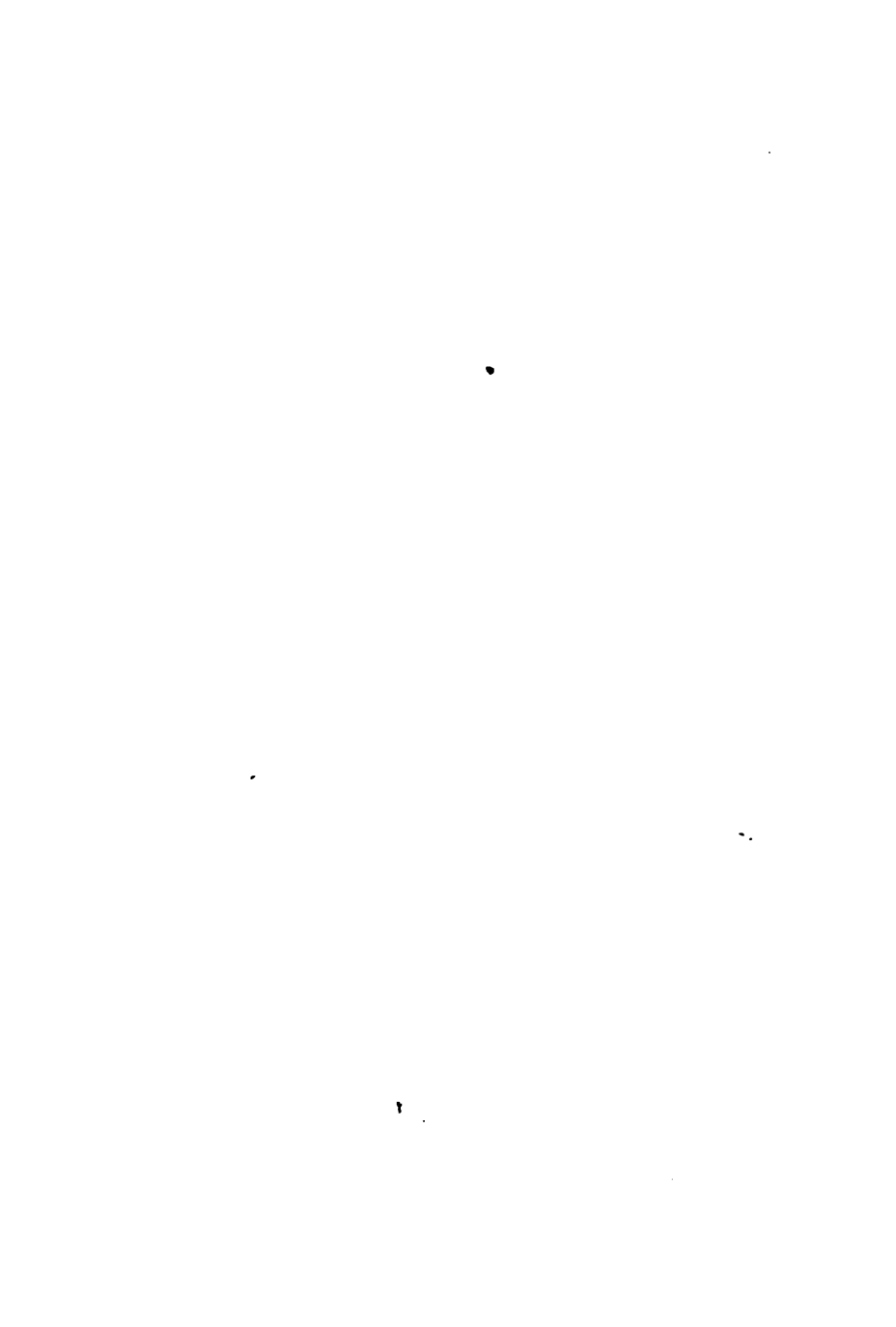
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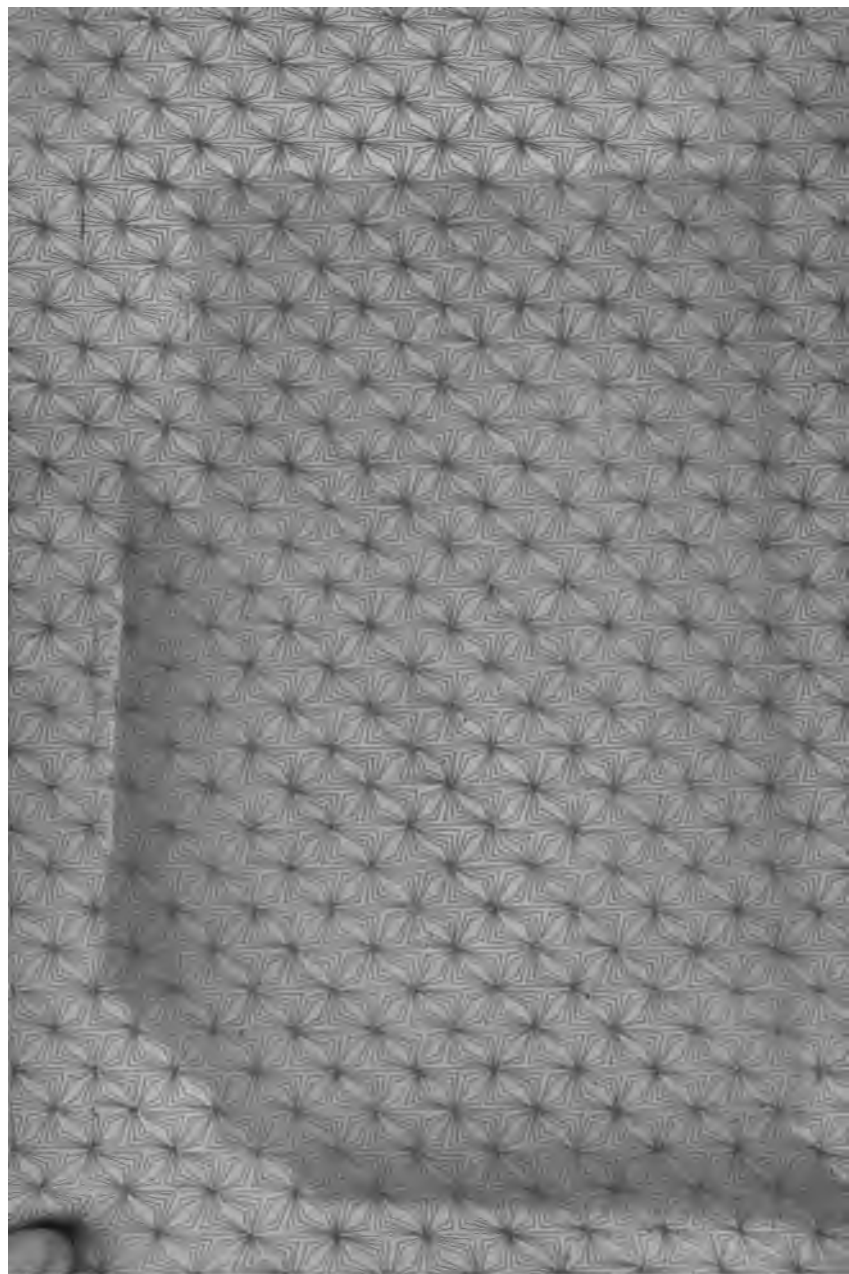
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